An Empirical Analysis of Financial Optimism and Portfolio Choice

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Table of Contents

List of Tables

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Abstract

The purpose of this thesis is to conduct a detailed study of optimism in financial decision making. I contribute to the literature by clarifying the relationship between financial optimism and individual investors' portfolio choice. I also investigate whether optimism benefits an investor's objective and subjective well-being within the same study by using large-scale survey data. I then explore how feedback, framing, and personality, contribute to financial optimism using controlled user experiments. Both survey-based and experimental approaches are applied in this thesis to study various aspects of optimism in a financial decision making domain.

In this thesis I propose a theoretical framing work for measuring financial optimism and use these measures to analyse investor profiles. My survey-based studies show that optimistic investors prefer to invest in risky portfolios to risk-free portfolios, and borrow higher debt and larger mortgages. Optimists are significantly younger with lower accumulated financial wealth compared to non-optimists. Financial optimism is found to be beneficial in improving objective well-being by increasing future financial wealth, but this positive effect is very limited in terms of increasing future total wealth. Optimism is associated with current happiness and satisfaction which means optimism might help to improve current subjective well-being, but the long-term effect of optimism on happiness might be less desirable if the investor's realised financial situation is lower than expected.

By conducting experiments on subjects given investment tasks in a controlled environment, I find that positive feedback on previous portfolio returns decreases optimism when forecasts on future portfolio returns are made in absolute values, while positive feedback increases optimism when participants forecast in relative terms. I also show that framing influences financial optimism - optimism is higher when forecasting in absolute values than in percentages. I discovered that certain personality traits, such as extraversion and modesty, correlate with financial optimism. Optimism is also strongly positively associated with an attitude for risk tolerance.

The overall implications of this thesis is that when making a financial decision, individual investors should not neglect the effect of optimism on their choice of portfolio. Optimism is beneficial towards both objective and subjective well-being, however such positive influence of optimism is fairly limited and should not be magnified. Optimism might not be subject to the control of an individual because optimism could derive from environmental factors, such as feedback and framing, as well as from internal factors to the investor, such as personality and innate risk attitude.

Chapter 1

Introduction

1.1. Thesis Motivation

This thesis aims at thoroughly investigating optimism, particularly financial optimism, and its impact on financial decision making. The thesis has three main purposes, first to reveal the relationship between financial optimism and individual portfolio choice, then to study whether being optimistic is beneficial to investor well-being, and finally I explore the contributing factors for optimism.

Previous literature shows that people tend to be unrealistically optimistic about their future (Weinstein, 1980). The majority of people believe their risk is less than average in surveys regarding automobile accidents (Robertson, 1977), crime (Weinstein, 1977), and disease (Harris & Guten, 1979). Subjects' prediction of outcome of social events tend to match their preferences (McGuire, 1960), and optimistic biases are observed even among purely chance related events (Langer & Roth, 1975).

Optimism and its influences on economic or financial decisions have not been studied for long. According to Manglik (2006), research on behavioural biases, such as optimism, in financial decision making began to gather momentum in economics only in the seventies. Among more recent studies on the impact of behavioural issues on the economy, optimism is understood to have affected many economic phenomena (Puri and Robinson, 2007). Optimism is claimed to affect corporate management financial decisions and entrepreneurs' behaviour (March & Shapira 1987; Gervais, Heaton and Odean, 2002; Heaton, 2002; Hackbarth, 2007); it has influences on asset management and investors, affecting asset pricing and causing the under- and over-reaction of stock prices to events (Lee, Shleifer, and Thaler, 1991; Barberis, Shleifer and Vishny 1998); it is an important justification for the existence of financial intermediation (Coval and Thakor, 2005); and optimism has an impact on consumer

expenditures (Kacperczyk and Kominek, 2002).

However the role that optimism plays in the portfolio choice of individuals who are not professional investors has not been sufficiently studied. As optimism may contribute to the neglect of risks (Tennen & Affleck, 1987), I suspect optimistic individual investors would prefer risky assets in their portfolio compositions. Optimism may affect normal individuals in similar ways that it influences financial or business professionals. In this thesis I prove that there exists a positive relationship between optimism and individual investors' preference for risky portfolios by employing a very large set of survey data.

Once the relationship between financial optimism and individual portfolio choices is tested, I move on to inspect whether it is beneficial to be financially optimistic in terms of increasing one's objective and subjective well-being. Literature shows that general optimism has both beneficial and undesirable effects on well-being. It is claimed that optimism amplifies the efficacy of medicines in curing illness, encouraging individuals to take on ambitious tasks and behave robustly when encountered with difficulties (Gollier, 2005; Weinstein & Lyon, 1999; Bénabou & Tirole, 2002). On the other hand, optimism could lead to the neglect of risk and bias people's perceptions of the probability of achieving favourable outcomes (Weinstein & Lyon, 1999). Optimism could also increase current felicity (the state of being happy) but lower future felicity (Gollier, 2005). In this thesis I test the effect of optimism on objective well-being and subjective well-being within the same survey data set to get a more conclusive result on optimism's effect in financial decision making and individual investors than studies in previously published literature.

If financial optimism does provide certain benefits to individuals' well-being, then the question turns to why some people are more optimistic than others and what factors affect optimism in financial decision making processes. Optimism is rooted in motivations as well as cognitive

biases (Coelho, 2010). Literature in this area shows that optimism exists to serve certain purposes, such as to enhance positive self images or respond to incentives (Gollier, 2005; Weinstein & Lyon, 1999; Batchelor, 2007; Bénabou & Tirole, 2002). Cognitive bias, such as the illusion of control, could be another source of optimism (Kahneman & Lovallo, 1993). Among the factors that may affect optimism, I'm particularly interested in factors that are closely associated with individuals' decision making, such as receiving feedback on historical performance, the framing of the financial decision making problem and the investor's personality.

My study of financial optimism could help individual investors realise and recognise psychological factors at work in their financial decision making processes. This research provides insight into the beneficial as well as unfavourable effects of optimism on their well-being. It identifies the contributing factors of financial optimism so that individual investors can be more conscious of what is within and outside of their control when they form their future expectations of the result of their financial decision.

1.2. Contributions

The theoretical framework of my financial optimism measures is innovative. I define three measures of optimism within the financial decision making domain: *Financial expectation*, *A priori optimism*, and *A posteriori optimism*. Optimistic bias in different life domains or different decision making processes may not be the same, and general optimism might not be able to fully capture investor optimism on future financial situation. I also incorporate a rational value for financial expectation as a benchmark for *A priori optimism* and *A posteriori optimism*, which I believe is an improvement on the optimism measures without benchmarks used in previous literature.

The methodology of this thesis varies in different chapters. I combine the strengths of large-scale survey data analysis with controlled-environment experimental approaches in one overall study. This enables me to investigate the relationships between financial optimism and portfolio choice by analyzing large-scale field data and test a number of explanatory factors of optimism within an enclosed experimental environment. Each method, either survey-based or closed-environment experiment, has served my intended research purpose well. By using a comprehensive generalised optimism framework throughout this thesis, I also avoid being confined by the limitations of using each method alone while maintaining a clear narrative across thesis chapters.

I believe my research also fills gaps in the published literature. There is little research on the how optimism is related to household or individual investors' portfolio choices as most published research focuses on how optimism affects business and finance professionals. Published literature shows there is a correlation between general optimism and subjective well-being, but no previous study looks into how optimism affects objective well-being and

subjective well-being within the same study to obtain more conclusive and coherent findings. Optimism has motivational and non-motivational causes, but what contributes to financial optimism has not been investigated before.

To summarise, this thesis proposes novel financial optimism measures and uses these measures to study individual investor behaviour in both large-scale surveys as well as in controlled environment experiments. It also contributes to the existing literature in finance by studying how feedback, framing and personality influence optimistic bias and by investigating the benefits of financial optimism.

1.3. Main Findings

Chapter 2 provides a comprehensive overview of the existing published literature on optimism. It introduces the definitions of optimism in previous research within psychology and finance. It reveals that both motivational and non-motivational reasons can explain why optimism widely exists among populations. The literature also shows that optimism affects decision making in various social domains. Optimism promotes the neglect of risks and therefore could lead to riskier behaviour in financial decision making. Measures of optimism in financial studies are often problematic, therefore I propose a novel theoretical framework with my measures for financial optimism: *Financial optimism*, *A priori optimism*, and *A posteriori optimism*.

Chapter 3 introduces the British Household Panel Survey (BHPS) as my main data set for survey-based analysis in this thesis. I define *Financial expectation*, *A priori optimism*, and *A posteriori optimism* with respect to BHPS data. I found that respondents in the BHPS are more optimistic than pessimistic on average. Financial optimism seems to coincide with economic cycles. Correlations among selected variables in the BHPS are illustrated. Financial optimism is observed to be negatively correlated with the amount of an individual's savings and investment. Wealth variables, such as income, savings, and investment are highly correlated with each other.

Chapter 4 aims to test the relationship between financial optimism and household portfolio choice, which is the portfolio choices made by normal individual investors in the BHPS data. The effect of optimism on economics and other social domains have been well researched, but there is a lack of research on how optimism influences household portfolio choice. I believe it is important to study optimism and decision making within each life domain. By comparing the

profile of optimists, pessimists, and neutral respondents in the BHPS, I found optimists are significantly younger, more likely to be male, more educated and are more likely to be self-employed than pessimists or neutral respondents. Optimists have lower accumulated wealth than non-optimists. Financial optimism is positively correlated with investment in riskier portfolios. Although an optimistic investor has low absolute amount of savings and investment, a higher percentages of her wealth is kept in risky assets than in risk-free assets. Financial optimism is also positively related to borrowing debt, which means optimists have higher risk preferences for their portfolios. The main implication of this chapter is to help individuals to be aware of how psychology factors, such as financial optimism, could affect their financial portfolio choice.

Chapter 5 investigates whether financial optimism benefits individuals' current and future well-being by analyzing the BHPS data. Research has been conducted previously on how optimism affects well-being but there are no conclusive and coherent findings on this issue as to the impact of optimism. Objective well-being and subjective well-being were often researched in separate studies. By using the BHPS data, financial optimism is found to be negatively correlated with both current financial wealth and current total wealth. Optimism improves one's future financial wealth but does not significantly increase total wealth. This may be because optimists work hard to achieve better financial status but due to lower starting off points compare to non-optimists on total wealth, the increase of financial wealth is overshadowed by the increase in property values over the years as house values is a large component of total wealth measure in this study. *Financial expectation* has a positive relationship with current happiness and satisfaction, but *A priori optimism* and *A posteriori optimism* have little effect on current subjective well-being. *A posteriori optimism* is negatively correlated with the increase in future happiness because an investor is likely to become less happy if his financial investment turns out to be lower than expected. The implication of my findings is that it is better to be optimistic because optimism helps to improve certain aspects of one's objective and subjective

well-being, but such positive effect of optimism is very limited. Therefore while optimism brings a benefit, one should not have unrealistic expectations on what optimism can help her in terms of achieving great material or mental advantages.

Chapter 6 explores whether and how feedback, framing, personality, and risk attitude could affect financial optimism in an enclosed experimental environment. Motivational reasons and cognitive biases are thought to affect optimism in the literature, but what causes financial optimism is unknown. Evidence explored in this chapter shows that feedback on investment performance affects financial optimism depending on whether people forecast returns in absolute values or in relative terms. Financial optimism is increased upon receiving negative feedback when participants forecast in absolute values, while receiving negative feedback reduces financial optimism when participants forecast in relative terms on portfolio return. I find framing of the experiments affects one's financial optimism level directly and forecasting in absolute terms is more likely to result in optimistic expectations. I also find financial optimism correlates with certain personality traits, such as extraversion, modesty and altruism. Financial optimism also has a positive relationship with one's attitude on risk tolerance and risk-taking behaviour in financial investments. The purpose of this chapter is to understand what contributes to financial optimism and the switch from a survey-based study to controlled experiments method serve this research purpose well. This chapter indicates that investors should be aware of subtle elements, such as the framing of information or their own personality traits, which could bias their expectations and judgments.

1.4. Conclusions

This thesis contains both survey-based and experimental studies on optimism. My empirical results using the BHPS data find evidence that optimism is significantly positively correlated with risk taking behaviour in making financial decisions. Financial optimism is positively correlated with investment in riskier portfolios. Optimists prefer to allocate a higher portion of their wealth to investing in risky assets than risk-free assets and optimists also borrow higher levels of debt. Optimists are found to be younger, more likely to be male, have higher educational qualifications, are more likely to own a business, have lower accumulated financial wealth, and higher average unemployment rate than non- optimists.

Financial optimism also helps individuals to increase their objective well-being but such positive effect is relatively small compared to the effect of other demographic variables, such as the value of one's home. Appreciation in home values surpasses the effect of optimism on improving one's total wealth level. Financial optimism also positively correlates with current happiness and satisfaction but it reduces future happiness. This indicates optimism does benefit individual's current subjective well-being but its long-term effect on subjective well-being could be adverse. While the advice here is to stay optimistic given the situation one is in as optimism brings along certain benefits to one's well-being, the limitation of the favourable effects of financial optimism should not be ignored.

By conducting controlled experiments, I found positive feedback on portfolio returns reduces financial optimism when forecasting in absolute values, while they increase financial optimism when forecasts are made in relative terms. Framing affects the level of financial optimism. If the forecasting task is framed in absolute values (participants are asked to forecast portfolio returns in values), optimism level increases. In my experiments, I found financial optimism is

negatively correlated with extraversion, friendliness, altruism, modesty, morality, and liberalism, but is positively correlated with cooperation. This implies people with certain personality traits may be more (or less) likely prone to be optimistic. Higher risk tolerance promotes financial optimism.

The purpose of this thesis is to help individual investors realise how a psychological factor, optimism in this case, could affect their investment behaviour. It identifies the benefits and harmfulness of being optimistic to individual investor welfare. It hopefully will make individuals aware of what affects their optimism and financial decisions. Overall, this thesis studies financial optimism in depth empirically, contributing to existing literature by providing a theoretical frame work for measuring optimism as well as providing practical advice for individual investors.

Chapter 2

Literature Review and Proposed Financial Optimism Framework

2.1. Introduction

Optimism in decision making has been robustly investigated and is accepted as a firmly established empirical phenomenon during the past three decades (Harris & Hahn, 2011; Helweg-Larsen & Shepperd, 2001; Weinstein, 1980). This chapter provides an overview of the existing published literature on optimism. It introduces the concept and definitions of optimism in both psychology studies and finance studies in section 2.2. In section 2.3, I reviewed the motivational as well as non-motivational explanations for optimism, followed by a literature review on the effects of optimism in various decision making processes in section 2.4. Section 2.5 discusses the problems with existing measurements of optimism in economics studies and proposes a theoretical framework for measuring financial optimism in this thesis. Section 2.6 concludes this chapter.

2.2. Definitions of Optimism

There are different measures of optimism in the literature. In psychology studies, unrealistic optimism refers to the tendency for individuals to believe that they are less likely than an average person to experience negative events (Weinstein, 1980; Aucote & Gold, 2005). Helweg-Larsen and Shepperd (2001) also defined optimistic bias as the tendency for people to report that they are less likely than others to experience negative events and more likely than others to experience positive events. An individual who is optimistically biased judges his or her own risk as less than the risk of others. Such errors in judgment, expecting others to be the victims of misfortune but not themselves and thinking themselves as invulnerable, are identified as unrealistic optimism by Weinstein (1980).

Weinstein (1980) conducted two studies that investigated the tendency of people to be unrealistically optimistic about future life events. In Study 1, 258 college students estimated how much their own chances of experiencing 42 events differed from the chances of their classmates. Overall, they rated their own chances to be above average for positive events and below average for negative events. In Study 2, students were asked to list the factors that they thought influenced their own chances of experiencing eight future events. Then the lists were read by a second group of students before they too estimated how much their chances of experiencing the events differed from their classmates. The amount of unrealistic optimism shown by this second group for the same eight events decreased significantly. This indicated people are unrealistically optimistic because they focus on factors that improve their own chances of achieving desirable outcomes and fail to realize that others may have just as many factors in their favour. The study also demonstrates how optimistic bias can be reduced by explicitly presenting relevant information to subjects.

Among a variety of methods for assessing the broader concept of optimism, the most common method in detecting optimistic bias involves having participants estimate their likelihood of experiencing an event relative to an appropriate peer or peer group such as an average person of the same age and sex (Helweg-Larsen and Shepperd, 2001). These estimates are typically assessed either directly or indirectly (Weinstein & Klein, 1996). When optimistic bias is assessed directly, a participant makes a single comparative risk estimate of his or her likelihood of experiencing a future event relative to a target's likelihood of the same event. The target is usually "an average other" of the similar age and gender. When optimistic bias is assessed indirectly, the participant makes two estimates - one estimate of his or her own likelihood and a separate estimate of the target's likelihood of a future event. Subtracting the two estimates creates a comparative risk estimate. (Klein & Helweg-Larsen, 2002). Some evidence suggests that the direct method tends to produce greater bias than the indirect method and that fewer response choices on the scale result in greater bias than a greater number of response choices (Helweg-Larsen and Shepperd, 2001). Covey and Davies (2004) argue that the direct measure focuses respondents primarily on their own state rather than on the difference between themselves and their peers.

In financial economics, optimistic individuals are defined as those who overestimate the probability of good outcomes and underestimate the probability of negative outcomes, therefore leading to more risk taking behaviour in financial decision-making (Kahneman and Lovallo, 1993; Heaton, 2002).

In most economics studies, optimism is commonly measured by Life Orientation Test (LOT) (Scheier & Carver, 1985; Trevelyan, 2008) without a "rational expectation value" as a benchmark. The LOT is a widely used scale that assesses the extent to which individuals have positive expectations regarding life outcomes. It is an eight-item measure where respondents are asked to rate on a five-point response scale the extent to which they agree with statements, for

example “I always look on the bright side of things”, and “I hardly ever expect things to go my way (reverse scored)” (Trevelyan, 2008). However, using LOT as data source to measure optimism only represents a general positive outlook for the future without a benchmark for the outcome of the decision or event such as a rational expectation. Questions on whether the measured optimism is in fact reasonable behaviour remains unanswered. In my study, I try to measure optimism of an outcome against forms of rational expectations and use a benchmark component approximating the rational expectation instead of only measuring optimism as a general positive outlook. My measures of optimism will concentrate on investors’ biases against the rational expected outcome of the financial event.

Another issue is that optimism is often measured without specifying a particular social domain (Hackbarth, 2007; Heaton J. B., 2002; Lee, Shleifer, & Thaler, 1991; Easterwood & Nutt, 1999; Kacperczyk & Kominek, 2002). Puri and Robinson (2007) used life expectancy miscalibration as a measure of optimism[1] and investigated its relationship with economic choices. It seems to me that this is a mix-match between one’s financial choices and optimistic belief in his or her life expectancy. Because it is possible that belief in life expectancy would correlate with changes in one’s health condition but optimism in financial situation might change with economic cycles for example. Although optimism in health might reflect a person’s general optimism partly, I believe it is more accurate to study optimism and associated behaviour within the same social domain so that the full effects of optimism can be captured. In my study, I tried to construct measures of optimism within financial decision making domain. Details of my measures of financial optimism are explained in section 2.5 after a comprehensive literature review on optimism.

[1] Life expectancy miscalibration is measured by comparing “a person’s subjective life expectancy to their actuarial life expectancy based on that person’s demographic and lifestyle characteristics” in (Puri & Robinson, 2007).

2.3. Determinants of Optimism

In this section, I look at the factors causing optimism. I review a number of literature providing motivational as well as cognitive explanations of optimism in the existing literature (Heaton J. B., 2002; Batchelor, 2007; Kahneman & Lovallo, 1993; Klein & Helweg-Larsen, 2002; Anderson & Galinsky, 2006).

2.3.1. Motivational Explanations for Optimism

Motivational explanation for optimism implies people intentionally distort information in order to serve a given purpose (Coelho, 2010). Factors such as who made the forecast and the motivation of the forecasters are likely to affect the optimism level in forecasting. Research has found optimistic bias widely exists among financial analysts, professional forecasters, and normal individual investors when they make investment decisions or forecast future returns (Heaton J. B., 2002; Hackbarth, 2007; Barberis, Shleifer, & Vishny, 1998; Kacperczyk & Kominek, 2002; Butler & Lang, 1991; Batchelor, 2007). With regards to adjusting forecasts, studies have found optimistic bias causes analysts to adjust financial forecasts predominantly in the upward direction (Eroglu & Croxton, 2010). Positive and negative forecasting errors in adjusted forecasts would be roughly equal in number and magnitude in the absence of optimism bias. But optimistic forecasters tend to project mainly high sales for the future, resulting in predominantly positive forecasting errors. The measurement of forecasting errors will be used as one form of my financial optimism definitions.

There are three explanations about why a forecaster would publish a persistently biased forecast (Batchelor, 2007). Firstly the forecasters might not have the necessary skills to exploit information efficiently and failed to learn from previous forecast errors. Secondly, there might

not be sufficient information to make an accurate forecast. Thirdly, analysts purposely make optimistic or pessimistic forecasts in response to financial or reputational incentives. They might "adjust" their forecasts to make the forecast appear more attractive to their clients, favour or oppose government policies, support certain economic actions, or commit to be consistent with previous forecasts (Batchelor, 2007). In commercial organisations, optimistic forecasts are sometimes used as sales targets (Lawrence & O'Connor, 2005). Forecasts may be set high to encourage hard work in an organisation and a drive to achieve higher earnings.

Within an organisation, pessimistic opinions are sometimes suppressed as pessimism about the organisation could be interpreted as disloyalty and the bad news bearers tend to be avoided (Janis, 1982). Optimism within a group can be reinforced and unrealistic views are accepted by group approval. Optimistic errors are especially likely to occur when new technology is involved or when firms step in an unfamiliar territory (Kahneman & Lovallo, 1993). Many important decisions within a company are led by unrealistic optimism, and investment projects often finish late, exceed budget, or fail to achieve goals as results of unrealistic forecasts.

When predicting corporate earnings, financial analysts who use bottom-up strategies are more optimistic than their counterparts who adopt top-down methods (Darrough & Russell, 2002). The differences between the two types of forecasts are due to different incentives. Analysts who follow up the development of a particular company need to maintain the channel through which they can gain access to mangers' private information, therefore analysts are less willing to damage such relationship by giving bad forecasts. Top-down analysts have less incentive to keep a good working relationship with companies' management and hence do not hesitate to give less optimistic forecasts if supported by macroeconomic data. As Sedor (2002) points out, analysts intentionally issue optimistic forecasts in response to incentives, such as to encourage stock trades (Kim & Lustgarten, 1998), increase the value of stocks held by in-house mutual funds, and to obtain or maintain investment banking business (Lin & McNichols, 1998; Dugar

& Nathan, 1995; Dechow, Hutton, & Sloan, 2000; Hunton & McEwen, 1997).

Other research found that group-generated forecasts are more likely to be optimistic. Although almost all the research has examined individuals' forecasting, most forecasts are made by a group (Lawrence, O'Connor, & Edmundson, 2000). Some research found that a group does seem to produce more accurate forecasts than simply averaging individuals' pre-group judgments (Ang & O'Connor, 1991; Sniezek, 1989). However, others found that forecasts generated by group discussion are more optimistic than those generated individually (Brenner, Griffin, & Koehler, 2005). Group discussion tends to focus participants' attention on the factors promoting success and therefore increase their optimism. Decision makers tend to take an inside view which results in overly optimistic forecasts rather than take an outside view that adopts a broader and more comparative approach (Kahneman & Lovallo, 1993).

The differences and interactions between institutional and individual sentiment contribute to rising or falling levels of optimism (Schmeling, 2007). Institutional sentiment forecasts stock returns correctly on average while individual sentiment drives markets away from fundamental values. When institutional investors recognise that a stock price has been driven above (below) its intrinsic value, they become more pessimistic (optimistic) and expect individual investors to be more optimistic (pessimistic). Moreover, when institutional investors recognise that noise traders might push prices even higher above (further below) fundamental values, they become more optimistic (pessimistic) when they expect individuals to become even more (less) optimistic (pessimistic). This is because overly optimistic (pessimistic) individual traders have driven prices above (below) fundamentals, which will eventually cause a correction in stock prices to fundamentals. If institutional investors expect individual traders to become more optimistic (pessimistic) over short horizons they rationally incorporate this price pressure into their expectations and raise (lower) their sentiment.

Sedor (2002) investigated whether forecast optimism is an unintentional consequence of analysts' reactions to the structure of information about managers' future plans. She provided evidences that the structure of information managers provide about their future plans could induce scenario thinking and causes analysts to unintentionally issue optimistic earnings forecasts for companies. She also found that such unintentionally scenario-induced optimism is greater for a firm with prior losses than for a firm with prior profits. Analysts who wish to not be biased must be able to analyze the scenarios managers provide and evaluate the plausibility and likelihood of alternative outcomes.

2.3.2. Cognitive Explanations for Optimism

Although there is much research which shows that optimism has its motivational roots and individuals can behave tough when encountered with difficulties and maintain positive images of themselves (Gollier, 2005; Weinstein & Lyon, 1999; Bénabou & Tirole, 2002), cognitive biases have effects on optimistic bias and cognitive explanations suggest people should be considered innocent victims of their thought processes (Hoorens, 1993; Coelho, 2010). Research find non-motivational reasons can also play an important role in making people optimistic (Klar, Medding, & Sarel, 1996; Chambers, Windschitl, & Suls, 2003).

Anderson and Galinsky (2006) studied the relationship between the sense of power, optimism, and risk-seeking. They asked participants to report their generalised beliefs about the power they have in their relationships with others and to estimate their own chances of experiencing 15 different life events. They found evidence across their studies that sense of power increases optimism in evaluating risks and increases the tendency to engage in risky behaviour. A higher sense of power is related to higher level of optimism, not only regarding personally relevant future events but also the perception of danger in the world at large. Power inspires action and

shifts attention away from fear of danger and towards optimism on the potential payoffs associated with risky activities (Anderson & Galinsky, 2006; Ronay & von Hippel, 2009).

Previous studies found that illusion of control is another source of optimism (Kahneman & Lovallo, 1993) and the perceived controllability of the events is the most robust determinant of comparative optimism (Klein & Helweg-Larsen, 2002; Smits & Hoorens, 2005). Weinstein (1980) found people are more optimistic over controllable events than uncontrollable events. The perception of control is also negatively correlated with personal risk estimates (Helweg-Larsen & Shepperd, 2001). In order to investigate further details of the relationship, Klein and Helweg-Larsen (2002) examined the overall strength of optimistic bias and control relationship across 22 previous studies and they found the greater control people perceive, the greater their optimistic bias. They also found that this relationship is moderated by other factors such as participant nationality, student or non-student status, and measures of optimism and control. One of the reasons that illusion of control leads to optimism might be when people believe they can control their outcomes, they believe they can take actions to increase the chance of a desired outcome and avoid the occurrence of an undesired outcome (Carroll, Sweeny, & Shepperd, 2006). However, some other research did not find a positive relationship between optimism and perception of control (Darvill & Johnson, 1991; van der Velde, van der Pligt, & Hooykaas, 1994).

Positive illusions about oneself can cause optimism bias (Taylor & Brown, 1988). Optimism appears to imply the bias of self enhancement (Alicke & Govorlin, 2005), and self-efficacy is correlated with measures of optimism (Macko & Tyska, 2006). Optimists also believe themselves to be better than average in their abilities and their chances of influencing courses of events (Sedikides & Strube, 1997; Hilton, Régner, Cabantous, Charalambides, & Vautier, 2010). Hilton, et al. (2010) found that the optimism scores reflect self-enhancement motives. They found that subjects believe they will be better off than others, rather than believe that everything

will turn out for the best for everyone.

Jacquemet, Rullière, and Vialle (2008) conducted an experiment which further illustrated that people tend to underestimate their own likelihood of experiencing negative outcomes compared to their peers. In the experiment, subjects can choose to invest in a risky lottery which yields bad or good outcomes, or a riskless investment. When it is revealed that several people in the room had bad outcomes from choosing the risky option, subjects invest more in the risky option than if the probability of the bad outcome is simply given as a number.

Illusions about oneself widely exists among the population and there is a large number of people who believe themselves to be above average regarding activities from driving safely to taking managerial risks (MacCrimmon & Wehrung, 1986). People, including entrepreneurs and executives, often exaggerate their control over events or the skills they have in achieving positive outcomes (Kahneman & Lovallo, 1993). Management refuse risk estimates provided to them (Shapira, 1986) and often view risks as if they could be reduced by their wisdom and managerial skills (Donaldson & Lorsch, 1983). People in general are more optimistic about the outcomes of controllable events and they prefer skill related options to chance related options even if control over the skill-based options is ambiguous (Harris, 1996). Success-oriented people tend to view the availability of time as an asset that allows them to control outcomes and increase the chance of success compared to failure-oriented people. They believe the more time they have, the more they can enhance their performance (Nisan, 1972).

Klar et al (1996) argue that optimism occurs when estimators think about a target's unique risk-reducing features but they fail to consider the same risk-reducing factors of peers. They found that people judge the vulnerability of familiar targets differently from that of generalised targets. This behaviour tends to lead to an optimistic bias favouring the familiar targets even if the familiar targets and generalised targets are the same set of people. In other words, a familiar

target individual is considered to be less vulnerable to risks compared to a generalised target. Weinstein (1980) was the first to empirically demonstrate a relationship between a nonmotivational form of egocentrism, event frequency, and comparative estimates. Chambers et al (2003) further investigated how event frequency might affect comparative optimism and pessimism. They found higher absolute frequency of events produces higher comparative estimates.

Windschitl, Kruger, and Simms (2003) investigate people's optimism in competitions with shared benefits and adversities. In their experiments, the presence of shared adversities (factors that would harm the absolute performance of all competitors) and benefits (factors that would help the absolute performance of all participants) was manipulated. Shared adversities tend to reduce people's subjective likelihoods of winning while shared benefits tend to increase the winning chances. They found that when people judge their likelihood of winning, their evaluations of their own strengths and weaknesses have greater impact than their estimates of their competitors' strengths and weaknesses. In a competitive environment, people's optimism about winning a competition will be greater when a shared benefit rather than a shared adversity is introduced.

Both motivational and cognitive reasons affect optimism (Coelho, 2010). Optimistic busineess or financial professionals often make positive future forecasts which are attractive to clients, favor government policies and enhance their own financial rewards (Batchelor, 2007; Sedor, 2002). High sense of power leads to high levels of optimism (Anderson & Galinsky, 2006), and an illusion of control is another source of optimism (Kahneman & Lovallo, 1993).

Bénabou & Tirole (2002) suggest that optimism could be "wired in" as a result of evolution which has selected a particular cognitive bias in humans. But the problem of this explanation they suspect is that "… the extent of overconfidence or overoptimism varies both over time

and across tasks, and a great many people actually suffer from underconfidence (the extreme case being depression). Furthermore, individuals often 'work' quite hard at defending their self-image when it is threatened, going through elaborate schemes of denial, self-justification, furniture- avoidance, and the like".

Helweg-Larsen and Shepperd (2001) examine determinants that affect the direction and size of the optimistic bias. In their paper, optimistic bias reflects a difference between two estimates: personal risk estimates and target risk estimates. They label moderators that affect people's personal estimates as personal risk moderators, and label moderators that affect people's estimates of the average person's risk as target risk moderators. They find that personal risk moderators - people experiencing a sad mood, dysphoria, state or trait anxiety, low control, or impending feedback are less optimistically biased than people not experiencing these states, traits, or situations. Optimism is also affected by one's personality and past experience (Seligman, 1991; Carroll, Sweeny, & Shepperd, 2006; Eroglu & Croxton, 2010). As for the target risk moderators, people were less optimistic when comparing themselves with a target that was psychologically close to them, similar, or specific than when comparing themselves with a target that was psychologically distant, dissimilar, or ambiguous. These conclusions are consistent with earlier findings by Johnson and Tversky (1983) who stated if someone is in a good mood, they are more likely to be optimistic in the evaluation of information and investment. Good (bad) moods will increase (decrease) the likelihood of investing in risky assets, such as stocks.

2.4. Effects of Optimism

I discuss the literature on the effect of optimism in this section. Researchers have studied the positive and negative effects of optimism. Previous literature suggests that people tend to be unrealistically optimistic about the future (Weinstein, 1980). Surveys concerning automobile accidents (Robertson, 1977), crime (Weinstein, 1977), and disease (Harris & Guten, 1979) find that many people believe their risk is less than average, but a few think their risk is greater than average. When people are asked to predict the outcome of social and political events, their predictions tend to coincide with their preferences (McGuire, 1960). Even for purely chance events such as a guess of heads or tails, people sometimes display optimistic biases (Langer & Roth, 1975).

This section provides evidence that individuals who work as business professionals or participate in the capital market consistently make incorrect assessments of probabilities, and particularly, individuals often overestimate the probability of good outcomes in financial decision-making (Heaton, 2002; Camerer and Lovallo, 1999; Rosen, 2003; Lee, Shleifer, and Thaler, 1991). I suspect that the optimistic bias that affects corporate managers, entrepreneurs, and asset managers can influence individual investors in a similar way. As optimistic business and finance professionals choose risky investment opportunities, individual investors with optimistic expectations of their future financial situation might also choose riskier portfolios.

2.4.1. Corporate Finance

a) Corporate Executives & Entrepreneurs

March and Shapira (1987) explore the relationship between the classical rational formation of

risk taking and conceptions of risks held by corporate managers. They conclude that managers' decisions are affected by the way their attention is focused on critical performance targets and managers may overestimate the probability of success and underestimate the risk of a decision.

Heaton (2002) states managers are "optimistic" when they systematically overestimate the probability of good firm performance and believe capital markets undervalue their firm's risky securities. Therefore they may decline positive net present value projects that must be financed externally. Optimistic managers might also invest in negative net present value projects even when they are loyal to shareholders. Hackbarth (2007) finds that optimistic managers overestimate corporate assets' growth rate and underestimate the assets' riskiness. They tend to choose higher debt levels and issue new debt more often compared to otherwise identical unbiased managers. Since the managers believe that equity is more underpriced than debt, equity is the last resort for funding projects following internal capital and debt.

Camerer and Lovallo (1999) propose that optimistic bias in relative ability is one explanation for the high amount of business start ups and failures. They created an experimental setting with basic features of business entry situations. In the experiments, most subjects who enter think the total profit earned by all entrants will be negative, but their own profit will be positive. These findings are consistent with the prediction that optimistic bias leads to excessive business entry.

Cooper, Woo and Dunkelberg (1988) surveyed 2,994 new entrepreneurs. The respondents perceived the chances for success for other similar businesses as relatively good while the chances for their own business as extremely high. They find optimists are systematically associated with a number of characteristics. Male entrepreneurs are found to be more optimistic than female business owners. Entrepreneurs with less than a high school education

as well as higher than high school education are both more optimistic than high school graduates. Those who had started their firms are more optimistic than those who inherited, purchased, or owned a franchised business.

Nofsinger (2005) argue that when social mood is high and more people are optimistic, some of these people will start businesses. When social mood is low and most people are pessimistic, thus fewer entrepreneurs have the confidence to start a business. Hence, the number of business start-ups reflects the level of social mood.

b) Mergers

If a CEO is optimistic enough about his firm's future performance that he fails to reduce his personal exposure to company-specific risk[1], Malmendier and Tate (2005) classify him as overconfident. They find overconfident CEOs are more likely to conduct mergers than rational CEOs, because they overestimate the returns to their investment projects and view external funds as overly costly.

Mitchell and Mulherin (1996) study mergers and conclude that mergers occur in waves, and mergers cluster by industry within each wave. Nofsinger and Kim (2003) argue that merger waves are due to the high social mood[2] that causes more CEOs to be optimistic. In other words, mergers waves are one result of a social mood cycle and increased optimism leads to more mergers.

Rosen (2003) examined the effects of mergers on bidding firms' stock prices. He finds

[1] Managers who hold options all the way to expiration (typically 10 years)
[2] "Social mood" is defined as "The general level of optimism/pessimism in society is reflected by the emotions of financial decision-makers" by Nofsinger (2005)

evidence of merger momentum, i.e. bidder stock prices are more likely to increase when a merger is announced during merger waves or if the overall stock market is doing better. He connects manager optimism with investor optimism and states that investor optimism also affects the market reaction to a merger and merger waves might reflect swings in investor optimism as much as the conditions of the merging firms or the economy.

The literature examined above illustrates evidence that individuals often overestimate the probability of good outcomes in financial decision-making. As managers and entrepreneurs, who are influenced by optimism, have an optimistic view of future performance or growth of their business, decide on risky business strategies, normal individual investors with optimistic expectations on their future financial situation might also make more risky portfolio choices.

2.4.2. Financial Markets

a) Initial Public Offerings

Lowry (2003) finds that investor sentiment, approximated by the discount on closed-end funds and the post-IPO market returns, is one of the important determinants of IPO volume. Rajan and Servaes (1997) examined data on analysts' forecasts for a sample of initial public offerings completed between 1975 and 1987. They find that analysts are optimistic about the earnings potential and long term growth prospects of recent IPOs. More firms complete IPOs if analysts are particularly optimistic about the growth prospects of recent IPOs

Lowry and Schwert (2002) find that more firms go public after observing high initial IPO returns for other firms. IPO initial returns will be high at a time of increased optimism. However, the resulting IPO issues will experience a time lag because it takes time for private firms to find an underwriter and go through the registration process with the Securities and

Exchange Commission. If the social mood decreases quickly, some IPOs that are in the registration process will be cancelled. Therefore, IPO volume should increase gradually during times of optimism and decline sharply when optimism decreases.

b) Stock Market Over- and Under-reaction

Lee, Shleifer, and Thaler (1991) examine the influence of investor sentiment on asset prices. They argue that fluctuations in discounts of closed-end funds are driven by changes in individual investor sentiment and closed-end fund discounts are a measure of the sentiment of individual investors. Closed-end funds frequently trade at a discount which is normally between 10-20% from net asset value (NAV). However, this discount can vary substantially over time. Individual investors are the most active type of investor in closed-end funds, and they also actively participate in small company stocks and IPOs. Lee et al. (1991) examine small firm returns, discounts, and IPO activity, and find them to be highly correlated. When sentiment investors are optimistic, they are willing to take more risk and buy stocks. Their buying influences closed-end fund prices, which decrease discounts. Their buying also moves small company stock prices and encourages investment banks to take more firms public.

Barberis, Shleifer and Vishny (1998) present a model of how investors form expectations of future earnings. Their model predicts that stock prices overreact to consistent patterns of good or bad news. After the announcements of series of good news, the investor becomes overly optimistic that future news announcements will also be good and hence overreacts, causing stock prices to increase. If subsequent news contradicts his optimism, the investor will achieve lower returns. Barberis et al. (1998) also predicts stock prices underreact to earnings announcements. They suggest that investors might use annual earnings numbers over five to seven years to estimate the growth rate in reality. If earnings have grown rapidly over the past five years, an investor might become over-optimistic about the future growth rates. Holding the

estimated long-run growth rate of earnings constant, investors might underreact to the quarterly earnings announcement.

Easterwood and Nutt (1999) find that analysts underreact to negative information, but overreact to positive information. They attribute this systematic under- and over-reaction to analyst optimism. They suggest that analysts can exhibit optimism due to economic incentives. The sell side analysts who are employed by brokerage and investment banks face the financial incentive and corporate pressure to promote the purchase of stocks rather than to produce statistically correct forecasts.

c) Stock Market Bubbles

According to Nofsinger (2005), a high level of optimism in society implies more optimistic investors. Many investors will buy stocks, trade and respond to IPOs excessively. He points out that capital markets throughout history have experienced episodes of widespread elated speculation followed by steady or sometimes sharp declines. Usually, speculative bubbles are inflated by the high optimism of investors. The peak of this optimism is characterised by emotional decisions instead of rigorous evaluation. When rational evaluation indicates that stock prices have become too high, the emotion of optimism becomes a stronger influence in the decision-making process. Investors hold higher risk portfolios, buy more stocks, and become more active in trading. The stock market rises and eventually becomes overvalued, relative to historical averages. Eventually, this over optimistic mood begins to decline. The previous degree of optimism proves unfounded. As the optimistic bias fades, rational evaluation becomes more influential. Prices are viewed as too high and investors stop buying. As a result, the stock market crashes. If social mood drops to a very low level, then pessimism will drive prices below historical averages. Thus, investor optimism/pessimism drives speculative asset bubbles and crashes.

The effect of optimism on financial markets has been examined from various perspectives in this section. Optimistic forecasts from financial analysts and an optimistic social mood encourage initial public offerings. Investors' optimism affects asset pricing and causes stock price over- and under-reaction. Eventually, when the level of optimism in society reaches a peak, stock prices are overpriced, causing market bubbles followed by crashes. However, the majority of these research studies do not focus on the investment behaviour of normal individuals but rather on the behaviour of financial professionals or the effects of aggregated levels of investors' optimism.

2.4.3. Household Financial Choice

a) Consumer Expenditure

With regards to households' studies, majority of the research tends to concentrate on the correlation between consumer sentiment and consumption (Kacperczyk and Kominek, 2002). Acemoglu and Scott (1994) and Carroll, Fuher and Wilcox (1994) show that increases in consumer sentiment are associated with increases in household expenditures. Optimism in society leads to economic activities that will be later measured as economic expansion (Nofsinger, 2005). Kacperczyk and Kominek (2002) construct a two-period model of an economy with two industries. Their model suggests that equilibria with higher levels of sentiment (such as optimism) are characterized by higher economic growth, higher production growth and higher proportion of investments in industries. They also show empirically that changes in sentiment predict future economic growth using U.S. data. Specifically, sentiment has a significant positive impact on industry growth, aggregate economic growth as well as levels of investment in different industries. Their results show that while the impact of consumer sentiment on future growth indicators tends to last only for short periods (one to

two quarters), the impact of investor sentiment is more enduring (up to four years).

b) Household Portfolio Choice

The household sector is not only the primary participant on the buy side of the product market and sell side of the labour market, but also on the buy side of the financial market (Welch & Welch, 2006). Therefore, a study on correlation between optimism and households' portfolio choices should not be neglected. Tennen and Affleck (1987) claim that a potential drawback to optimism may be a greater tendency for individuals to think that they are invulnerable towards risks. The reasoning is that if one has a positive expectation about the future, then there is little tendency to worry about the potentially negative consequences of a risky decision. Optimists might have a less powerful incentive to overcome their optimistic views and limit their risky decisions even though risky investments may lead to loss of wealth. According to Gollier (2005) positive thinking implies a mental manipulation of the objective probability distribution of assets returns. The negative effect of positive thinking is that this manipulation of beliefs is likely to affect the asset allocation of the investor. Puri and Robinson (2007) study optimism and economic choices using the Survey of Consumer Finances (SCF). They find that optimists work harder, expect to retire later, are more likely to own stocks and save more. They also find that moderate optimism correlates to reasonably sensible economic decisions while extreme optimism correlates to seemingly irrational decisions.

However, I believe optimism in different life domains or different decisions making processes may not be the same. For example, if one is optimistic about her life expectancy and health, it doesn't necessary mean one is optimistic about her financial situation and will invest more in the capital market. Measures of optimism in a general or non-financial domain may not fully precisely capture the optimism of an individual's financial situation. In Puri and Robinson's (2007) paper, it is possible that life expectancy miscalibration is independent from the

economic cycle and remains relatively stable throughout the subject's life time (unless there are changes in one's health status). Investor optimism in investment decisions will change with the ups and downs of financial markets which leads to different financial decisions.

2.5. Proposed Measures for Financial Optimism

When reviewing previous work on optimism in the above sections, I identified two problems in defining optimism in the literature. First, optimism is mostly measured without specifying a particular social domain. For example, when studying the effect of optimism on household portfolio choice, Puri and Robinson (2007) use life expectancy miscalibration as a measure of optimism for each individual in the sample. But I suspect that optimism in different life domains or different decisions making processes may not be the same. If one is optimistic about her life expectancy and health, it doesn't necessarily mean that she is optimistic about her financial situation and will invest more (or less) in the capital market. Though Puri and Robinson (2007) claim their measure of optimism correlates with positive beliefs about future economic conditions, I suspect that Puri and Robinson's (2007) measure might not fully capture investor optimism on future financial situation but rather is a measure related to general optimism. It is likely that investors' optimism in investment decisions will change with movements in financial markets and the general economy but life expectancy miscalibration might be independent from the economic cycle and remain relatively stable throughout an individual's the life time. Further research needs to be conducted to evaluate the efficacy of optimism in specific finance related decision making processes.

Second, in psychology studies on optimism, optimism is often measured by introducing a relevant peer or an average probability of the occurrence of a certain event as a benchmark (Weinstein, 1980; Helweg-Larsen & Shepperd, 2001). However, in many economics studies, optimism is often measured simply as a positive outlook into the future, such as using the Life Orientation Test (LOT) (Scheier & Carver, 1985; Trevelyan, 2008). There is often no attempt to calculate the rational financial return value as a benchmark for investor expectations. Without such a benchmark, it is very hard to distinguish irrational biased optimism from a general

positive point of view of one's financial returns which could be perfectly rational. The emphasis on distinguishing irrational optimism from a general rational positive outlook should not be neglected. In addition, a measurement of optimism without a rational benchmark may also falsely generate an optimism score when individuals are neutral or even pessimistic. For example, if there are two respondents and both think their next year's income will increase by 20%, they may both be perceived as "optimistic" as they both predicted an income increase. However, one of them knows in advance that she is going to be promoted therefore a 20% increase in pay is not surprising, Indeed she might even be quite conservative in predicting her 20% salary increase. In this case she is not optimistic in her expectation but neutral or potentially even pessimistic. Constructing measures for optimism without knowing the rational expected value for the event or financial decision results in over simplistic measures that don't really quantify irrational optimistic bias.

In this section, I propose and discuss the theoretical framework of my measures for optimism in the financial decision making domain. *Financial expectation*, *A priori optimism*, and *A posteriori optimism* are introduced as follows.

Financial expectation (E_t^{t+1}) is my first measure of optimism. This measure is similar to the definition of optimism in most existing economics research therefore shares flaws with them. It implies a general positive outlook for one's financial future situation without a benchmark. The advantage of this measure is that it's a straightforward measure and can be obtained by asking respondents direct questions such as "what do you think the economy will be like next year". However, such direct answer might not reflect "true" optimism. A positive signal cannot be simply interpreted as optimism assertively. For example, if an individual thinks she is going to be better off financially she might appear to be optimistic. If I am able to assess her financial situation I might find that she had recently received a substantial inheritance therefore she has enough reasons to rationally justify positively about her financial future. In

this case which appears to be optimism is actually neutral expectation. As discussed in earlier paragraphs, without a benchmark it is hard to detect optimism. If I can find a "rational value" as a benchmark, then it is possible to measure optimism more accurately and avoid measuring optimism only based on direct answers from subjects which do not reflect the full decision making environment. The problem is that this "rational expectation" is a theoretical value and is almost impossible to find in real life as well as in experiments due to problems in experiment design. As an improvement of the *Financial expectation* measure, I proposed *A priori optimism* and *A posteriori optimism* that try to incorporate a benchmark component approximating the theoretical "rational expectation" of individuals.

The second measure for optimism is *A priori optimism*, denoted as O_t^-. This definition is an a priori measure because it is calculated using information gathered before information about year *t* has been exposed. As I am very unlikely to have access to all information about an individual's financial situation, I use historical returns (C_{t-1}^t) as a benchmark and assume it captures individual financial return characteristics and information at time *t*, and therefore is the "rational expectation" an individual should hold when making the financial decision. Subtracting E_t^{t+1} and C_{t-1}^t results in *A priori optimism* O_t^-. *A priori optimism* improves the accuracy of measurement by using a benchmark component compared to *Financial expectation*. But the problem is although historical return values can indicate future events and reflect characteristic information about the individuals, it does not reveal new information that people have at the time of forecasting which might justify their positive expectation for future in real life. In other words, individuals might make a rational expectation that their future financial well-being will be better than historically expected, but I might consider them being optimistic because I do not have the new private information they have. For example, people are likely to receive similar salaries they received in the previous last year. Therefore their prediction of their financial situation should be similar to last years. But an individual might have the new information that he was offered a new job with a significant salary increase and therefore has

higher expectation for his financial future. This new information makes his seemingly optimistic expectation to be rational given the information he possess. *A priori optimism* indicates an investor is either irrationally optimistic (pessimistic) since she disregards her historical return (C_{t-1}^{t}), or she is rationally optimistic (pessimistic) if she has information that is not revealed to the researchers, or it could represent a mixture of both scenarios. On the other hand, *A priori optimism* is a much more suitable optimism measure in controlled experiment studies as the experimenter has all the information a participant needs to make a rational forecast. There is no hidden relevant information for the financial decision making process. Therefore theoretically, the *A priori optimism* measure can be considered as measuring irrationality decision making in controlled experiments given there is no unthought-of confounding factors in the design of the experiment.

A posteriori optimism, denoted as O_t^+, is my third measure for optimism. It is gathered at the end of year *t* after the information of year *t* has been exposed. Similar to *A priori optimism*, *A posteriori optimism* also improves the accuracy of measuring optimism by including a benchmark component. In *A posteriori optimism*, the rational expected value is assumed to be represented by the actual realisation of one's financial returns (C_t^{t+1}). *A posteriori optimism* is also called forecasting error and is similar to the definition of "unrealistic optimism" in some previous research (Arabsheibani, de Meza, Maloney, & Pearson, 2000; Coelho, 2010). However, unrealistic optimism implies that the mean forecast errors are significantly different from zero (Coelho, 2010), but *A posteriori optimism* emphasizes the difference between forecast and realisation of a single event. An advantage of *A posterior optimism* is that problem of not knowing private information related to the subject's financial decision is somewhat reduced as the realised financial return (C_t^{t+1}) captures this information. For example, if a subject knows she is going to get a promotion next year, the effect of this information may be revealed to the researchers by an increased realised financial return in the *A posteriori optimism*. The shortcoming of *A posteriori optimism* is that what happened in reality is very often not

"rationally expected". Individuals might make perfectly rational expectations based on the information they have at the time of forecasting but new information exposed during year *t* is completely out of individuals' control and knowledge space at time *t* and it is almost impossible for individuals to foresee what would happen and when in the future. For example, a successful individual who works in product retailing thinks she is likely to remain in a similar financial situation next year but is made redundant because a powerful earthquake destroyed the city where the product manufacturers are based. The *A posteriori optimism* measure would produce a positive score for optimism for this individual but this individual was actually being very rational at time *t* when she thought she was going to be financially stable and the fact that an earthquake will occur is information not exposed to her in advance. Therefore, *A posteriori optimism* represents irrational optimism or the effect of unexpected information exposed in year *t*. *A* posteriori optimism implies an investor is either irrationally optimistic (pessimistic) since her actual return (C_t^{t+1}) is smaller (greater) than her expected return (E_t^{t+1}), or/and she is rationally optimistic (pessimistic) if E_t^{t+1} is the rational expectation based on the information she had at the beginning of year *t* and the difference between E_t^{t+1} and C_t^{t+1} is in fact due to the effect of unexpected information exposed during year *t* and not irrational optimism.

The framework of measuring financial optimism using *Financial expectation, A priori optimism,* and *A posteriori optimism* is used in both survey-based and experimental analysis in the following chapters of this thesis.

2.6. Conclusion

Previous published literature demonstrates evidence that individuals' decision making processes are affected by optimism. I explained why optimism exists from the literature and reviewed both motivational and cognitive explanations for optimism. Then I review the effect of optimism in various social domains in the literature. Particularly in financial studies, investors, including corporate managers and financial professionals, consistently over-estimate the forecast of occurrences of good outcomes but under estimate the risk in financial decision-making.

However, the optimism measures in previous literature are not without their problems. Optimism is mostly measured in a general sense and there is little evidence of how optimism affects choices within the financial decision making domain. Optimism in financial studies is often measured by self-reported data without a benchmark for a "rational expectation value". At the end of this chapter, I proposed and discussed in details the theoretical framework in constructing measures of financial optimism (*Financial expectation*, *A priori optimism*, and *A posteriori optimism*) for both survey-based and experimental analysis in this thesis. This framework on the definitions for financial optimism is the main contribution of this chapter. The implementation of these optimism measures will be explained in the following chapters.

Chapter 3

Univariate Analysis of Optimism and Demographics in the BHPS

3.1. Introduction

In this chapter I introduce the data set and selected variables that will be analysed to study optimism and financial decision making empirically. The details of the British Household Panel Survey (BHPS) are explained in section 3.2. In section 3.3, I implement the theoretical framework for my optimism measures (*Financial expectation*, *A priori optimism*, and *A posteriori optimism*) proposed in Chapter 2 by using the BHPS data, and provide the descriptive statistics for optimism measures. For example, it was found that respondents in the BHPS are on average more optimistic than pessimistic.

Section 3.4 described the definitions of the demographic variables in the BHPS. It also provides descriptive statistics which shows a general profile of individuals in the BHPS. The time trends of the demographic variable and optimism measures are presented after the descriptive statistics. This is to illustrate the changes in variable values throughout the years as the BHPS covers a period from 1991 to 2007. Financial optimism seems to coincide with economic cycles. At the end of section 3.4, correlations among these variables are displayed followed by a detailed discussion on these relationships. These correlations provide a quick view of the relationships among demographic variables of the BHPS respondents. The conclusion of this chapter is presented in Section 3.5.

3.2. Data

Variables selected from the British Household Panel Survey (BHPS) for studying optimism are analyzed in Chapter 3, Chapter 4 and Chapter 5. The BHPS is a large comprehensive survey that followed the same representative sample of the households in the UK population from 1991 to 2007. About 11,000 individuals from 5,500 households drawn from 250 areas of Great Britain are interviewed each year as part of the survey. More than six millions of observations generated from the survey that are relevant and are employed in my study. The survey is conducted by the Institute for Social & Economic Research and is available through the UK Data Archive at the University of Essex. Information on savings, investment, and personal debt is only available from the 1995, 2000, and 2005 waves of the BHPS as such information was only collected in these three waves. Most of the demographic variables are measured on an annual basis.

3.3. Definitions of Financial Optimism using the BHPS

In my study, using survey data give me the advantages of employing a vast sample to study optimism in a real world situation. The details of the theoretical constructions of my measures of financial optimism were explained in section 2.5. In this section, I use the answers from BHPS questionnaires to generate scores for *Financial expectation*, *A priori optimism*, and *A posteriori optimism*.

3.3.1. Definitions for Financial Optimism

I use three measures for financial optimism, all of which directly measure financial optimism and although potentially useful, I do not suggest that these are measures of optimism in decision making in other social domains. The theoretical framework of these measures was detailed in section 2.5. In section 3.3.1, I explain how I implement the framework and generate financial optimism scores using the BHPS data. The optimism scores generated from the BHPS are used in analysis in Chapter 3, 4, and 5.

3.3.1.1. Financial Expectation

In the BHPS, respondents have been asked the following two questions regarding their opinion on the financial situation every year since 1991. I develop the scores for financial optimism based on these questions.

Question 1: Looking ahead, how do you think you will be financially a year from now, will you be Better off, worse off than you are now, Or about the same?

Question 2: Would you say that you yourself are Better off, or worse off financially than you were a year ago, Or about the same?

If *t* is the current year, I denote C_{t-1}^{t} as the change in financial situation during the past year. As the respondent has received these C_{t-1}^{t} historical returns in the past year, I potentially can assume C_{t-1}^{t} as the rational expectation of returns in year *t*. The respondent's *Financial expectation* for the year ahead made in the current year *t* is denoted as E_t^{t+1}. *Financial expectation* ($\boldsymbol{E_t^{t+1}}$) is my first measure of optimism.

3.3.1.2. A Priori Optimism

Based on the above assumption that historical C_{t-1}^{t} is the rational expectation of returns in year *t*, and optimism is the overestimation of probabilities of an outcome related to rational expectation, *A priori optimism*, denoted as O_t^-, is defined as follows,

$$\boldsymbol{O_t^- = E_t^{t+1} - C_{t-1}^{t}} \qquad \text{Equation 1}$$

This definition is *a priori* as the respondent's opinion for E_t^{t+1} is gathered before information about year *t* has been exposed. *A priori optimism* indicates an investor is either irrationally optimistic (pessimistic) since she disregards her historical return (C_{t-1}^{t}), or she is rationally optimistic (pessimistic) if she has information that is not revealed in the survey and therefore not known to us, or it could represent a mixture of both scenarios. A positive score of O_t^- indicates an investor is optimistic (irrationally or rationally), a negative score means she is pessimistic (irrationally or rationally), and a zero score implies she is a neutral respondent.

3.3.1.3. A Posteriori Optimism

A posteriori optimism, denoted as O_t^+, is my optimism measure about year *t* after information from year *t* has been exposed (with C_t^{t+1} as actual realised financial data gathered in the year from time *t* to *t+1*).

$$\boldsymbol{O_t^+ = E_t^{t+1} - C_t^{t+1}} \qquad \text{Equation 2}$$

A posteriori optimism represents irrational optimism or the effect of unexpected information exposed in year *t*. *A posteriori optimism* implies an investor is either irrationally optimistic (pessimistic) since her actual return (C_t^{t+1}) is smaller (greater) than her expected return (E_t^{t+1}), or/and she is rationally optimistic (pessimistic) if E_t^{t+1} is rational expectation based on the information she had at the beginning of year *t* and the difference between E_t^{t+1} and C_t^{t+1} is in fact due to the effect of unexpected information exposed during year *t*. A positive score of O_t^+ indicates an investor is optimistic (irrationally or rationally based on private information), a negative score means she is pessimistic (irrationally or rationally based on private information), and a zero score implies she is a neutral respondent.

3.3.2. Frequency Distributions of Financial Optimism

I report the coding and frequency distributions of my definitions of financial optimism using the BHPS data in the following tables.

Table 1 Frequency distributions of Financial expectation

Financial expectation is measured by the direct answers to the question "Looking ahead, how do you think you will be financially a year from now, will you be Better off, worse off than you are now, Or about the same?". "Better off" is coded as "2", "About the same or Don't know" is coded as "1", and "Worse off" is coded as "0". E_t^{t+1} in the third column from the left reports the frequency distributions for the three types of answers for *Financial expectation* in year *t* ($t \in [1991,2007]$). C_{t-1}^{t} in the forth column reports the actual change in financial situations for year *t-1*. The frequency distributions of E_t^{t+1} and C_{t-1}^{t} for the years that information on savings, investment, and debt was collected (1995, 2000, and 2005) are also reported respectively in the rest of the columns.

Financial Expectation	Code	E_t^{t+1}	C_{t-1}^{t}	E_{1995}^{1996}	C_{1994}^{1995}	E_{2000}^{2001}	C_{1999}^{2000}	E_{2005}^{2006}	C_{2004}^{2005}
Better off	2	25.8%	26.0%	26.5%	26.3%	28.8%	29.0%	25.4%	24.6%
About the same or Don't know	1	64.4%	52.4%	61.2%	46.3%	63.3%	50.6%	65.9%	55.3%
Worse off	0	9.8%	21.6%	12.3%	27.4%	7.9%	20.4%	8.7%	20.1%

Table 1 shows just over a quarter of the sample, 25.8% believe they will be financially better off for the next year throughout 17 year survey period. The majority (64.4%) think their financial situation remains about the same and 9.8% expect to be financially worse off. About the same percentage of people answer 'better off' when predicting and evaluating financial situation (25.8% and 26.0%) in a certain year. However, more than double the percentage of the respondents think they are financially worse off (21.6%) compared to a year ago than the percentage of respondents expect to be worse off for the next year (9.8%), which means people seem a lot less pessimistic when they look forward to the next year's future financial situation than when they evaluate the past year. Year 2000 sees the highest percentage of people believing they will be financially better off for the year ahead compared to year 1995 and year 2005.

Table 2 Frequency distributions of A priori optimism

A priori optimism is measured as the difference between *Financial expectation* for the year ahead and the actual financial changes for the past year ($O_t^- = E_t^{t+1} - C_{t-1}^{t}$). A positive score of *A priori optimism* means the respondent is optimistic about next year's financial situation while a negative score means the respondent is pessimistic. A score equals to zero indicates the respondent is neutral in her attitude towards next year's financial situation. The frequency distributions of O_t^- across 1991 to 2007, as well as in 1995, 2000, and 2005 are reported.

A Priori Optimism	Score	1991-2007	1995	2000	2005
Optimistic	2	6.8%	7.7%	6.9%	6.9%
	1	17.6%	20.4%	18.7%	16.3%
Neutral	0	57.7%	53.5%	55.7%	60.5%
Pessimistic	-1	16.2%	16.4%	17%	14.9%
	-2	1.7%	2.0%	1.6%	1.5%

From 1991 to 2007, 24.4% of respondents are optimistic while 17.9% are pessimistic, which means there are 6.5% more optimists than pessimists if I use *A priori optimism* as my measure. The majority (57.7%) remains neutral. Among optimistic respondents, 6.8% believe their financial situation for the year ahead will be better off but their perception of change in financial situation for the past year is worse off. 17.6% think they are going to be better off in the next year while they think their financial situation remains the same compared to a year ago, or they think they will be about the same financially for the next year while in the past year they become worse off. The percentages of respondents who have a positive score for *A priori optimism* remain stable throughout the wave 1995, 2000, and 2005.

Table 3 Frequency distributions of A posteriori optimism

A posteriori optimism is measured as the difference between *Financial expectation* for the year ahead and the actual financial changes for that year ($O_t^+ = E_t^{t+1} - C_t^{t+1}$). A positive score of *A posteriori optimism* means the respondent is optimistic about next year's financial situation while a negative score means the respondent is pessimistic. A score equals to zero indicates the respondent is neutral in her attitude towards next year's financial situation. The frequency distributions of O_t^- across 1991 to 2007, as well as in 1995, 2000, and 2005 are reported.

A Posteriori Optimism	Score	1991-2007	1995	2000	2005
Optimistic	2	4.8%	4.8%	4.7%	4.6%
	1	20.7%	20.6%	20.1%	20.1%
Neutral	0	57.3%	55.1%	56.9%	59.7%
Pessimistic	-1	15.8%	17.5%	16.8%	14.4%
	-2	1.4%	2.0%	1.5%	1.2%

From 1991 to 2007, 25.5% of respondents are optimistic while 17.2% are pessimistic. There are 8.5% more optimists than pessimists if I use *A posteriori optimism* as my measure. The majority (57.3%) remains neutral. Among optimistic respondents, 4.8% believe their financial situation for the year ahead will be better off but their perception of change in financial situation for the past year is worse off. 20.7% think they are going to be better off in the next year while they think their financial situation remains the same compared to a year ago, or they will be about the same for the next year while in the past year they become worse off financially. The percentages of respondents who have a positive score for *A posteriori optimism* remains stable throughout the wave 1995, 2000 and 2005.

Similar to many previously published studies on optimism, my measures of optimism in this chapter are implemented using BHPS user-reported discrete optimism scores. I am aware that these discrete optimism scores might be affected by the subjects' self-reporting bias and the researchers' coding choices for the discrete survey variables. On the other hand, using continuous optimism measures based on quantitative monetary data could avoid the above problems with discrete optimism measures and furthermore create domain specific optimism measures.

I treat optimism/pessimism as a single dimension as opposed to two variables. There were a number of studies on optimism published in the 1990's using many different problem domains (Chang, 2001). In some of these optimism and pessimism were not treated as uni-dimensional (Dember, et al, 1989). For example, the dispositional optimism measure could be based on a patient's forecast of the efficacy of their cancer treatment while the defensive pessimism measure could be based on the anticipation of negative side-effects of the treatment. I believe the bi-dimensional treatment of optimism and pessimism is not relevant in this study as my purpose is to investigate the correlation between financial optimism and portfolio choices rather than the relationship between optimism and pessimism. A financial forecast higher than the theoretical rational expected return is regarded as optimistic while a forecast lower than the rational expected return is assigned to be pessimistic. Optimism and pessimism are formulated to be in the same dimension. Although BHPS data only enables computation of discrete optimism scores, it at least provides five data points on the scale of optimism. A binary measure, such as treating respondents as optimistic versus non-optimistic, would lose even more granularity on the level of an individual's optimism.

3.4. Demographic Variables in the BHPS

This section introduces the definitions of the demographic variables selected from the BHPS. It also shows the descriptive statistics, time trend and correlations of these variables,

3.4.1. Definitions for Demographic Variables

In the BHPS, the following demographic variables are selected for studying optimism in future chapters. The reasons and details of the selection criterion for the selection of demographic variables will be explained in Chapter 4.

Table 4 Definitions of demographic variables in the BHPS

The left column reports the name of the demographic variables I selected from the BHPS. The middle column reports the definitions or explanations of these variables. The right column links the variables to their original questionnaire which can be found in Appendix 6 Financial optimism and the ratio of risky assets to financial wealth for all individual investors
This table reports the regression results for using home value to financial wealth as a definition of risky portfolios. Variables listed in the left column including financial optimism and demographics are independent variables for the regression. The ratio of current value of personal residence to financial wealth (VPR/FW) in the first row is the dependent variable in the regression equation. Beta coefficients and the *p*-values associated with each coefficient are reported in the rest of the columns. *Financial expectation*, *A priori optimism*, and *A posteriori optimism* are used as measures of Financial optimism with coefficients and *p*-values reported respectively under each measure.

	Risky Portfolios: VPR/FW					
	Financial Expectation		**A Priori Optimism**		**A Posteriori Optimism**	
	Beta	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**
Financial expectation	-0.020	0.000	0.014	0.008	-0.004	0.488
Age	0.062	0.000	0.068	0.000	0.054	0.000
Male	0.006	0.304	0.005	0.358	0.006	0.250
Married	0.135	0.000	0.135	0.000	0.119	0.000
White	-0.019	0.001	-0.018	0.001	-0.017	0.002
Healthy	0.014	0.008	0.015	0.006	0.014	0.010
Household size	0.073	0.000	0.073	0.000	0.090	0.000
Annual income (ln)	-0.175	0.000	-0.177	0.000	-0.165	0.000
Annual household income (ln)	0.108	0.000	0.109	0.000	0.110	0.000
Business ownership	-0.001	0.847	-0.002	0.703	-0.003	0.564
Finance related occupation	0.018	0.001	0.018	0.001	0.022	0.000
Employment: permanent contract	0.120	0.000	0.120	0.000	0.110	0.000
Unemployed	0.016	0.007	0.012	0.039	0.002	0.684
Unemployed a year ago	-0.035	0.000	-0.034	0.000	-0.034	0.000
Education: first degree or above	0.031	0.000	0.030	0.000	0.031	0.000
R Square	0.066		0.066		0.066	

Appendix 7 1.

Demographic Variables	**Definition**	**Questionnaire (Appendix 1)**
Savings (wSAVEK & wSVACK)	Include savings with a bank, post office or building society, national savings bank (post office), TESSA only ISA or Cash ISA.	Question 3 & 4
Investment (wNVESTK)	Include shares (UK or foreign), stocks and shares ISA or PEP, premium bonds, unit trusts/investment trusts, national savings bonds, national savings certificates, and other investments such as government or company securities.	Question 3 & 5
Personal debt (wDEBTY)	Total debt a person owns apart from mortgages and housing related loans	Question 6
Age (wAGE)	Age at date of interview	Derived from Question 7
Male (wHGSEX)	Sex of the respondent	Question 8
Married (wMASTAT)	Married and living as couple are regarded as 'married', while widowed, divorced, separated, never married, and under 16 are regarded as 'unmarried'	Question 9
White (wRACE & wRACEL)	White British and any 'other white background' are labelled as 'white', while 'Mixed', 'Asian or Asian British', 'Black or Black British', 'Chinese or other ethnic group' are denoted as 'non-white'	Question 10
Healthy (wHLSTAT)	Health status over last 12 months: excellent, good, fair, poor, or very poor. 'Healthy' is defined as 'excellent, good, and fair', and 'Unhealthy' is defined as 'poor or very poor'	Question 11
Household size (wHHSIZE)	Number of persons in household	Derived from Question 12
Total financial wealth	Savings + Investment	
Total wealth	Savings + Investment + Current homevalue	
Annual income (wFIYR)	Annual income of the respondent for the year	Derived Variable
Annual household income (wFIHHYR)	Annual household income of the respondent for the year	Derived Variable
Home ownership (wHSOWND)	Whether house is owned (owned or being bought on mortgage)	Question 13
Home purchase price (wHSCOST)	How much did the respondent pay for the property	Question 14
Current home value (wHSVAL)	Estimated value of property today	Question 15
Mortgage outstanding (wMGTOT)	Total amount of respondent's outstanding loans on all the property they own	Question 16
Business ownership (wJBSEMP or wJ2SEMP)	Self-employed or has own business as a second job	Question 17
Finance related occupation (wJBSOC)	All the finance related job will be categorized as 'Finance related occupation' and all other occupation will be though as 'other occupations'. The finance related job include the following groups: 120 Treasurers & company financial managers, 121 Marketing and sales managers, 131 Bank, Building Society & Post Office managers, 139 Other financial institution & office managers, 251	Question 18

	Management accountants, 252 Actuaries, economists & statisticians, 253 Management consultants, business analysts, 361 Underwriters, claims assessors, brokers, investment analysts, 362 Taxation experts, 410 Accounts & wages clerks, book-keepers, other financial clerks, 411 Counter clerks & cashiers, and 412 Debt, rent & other cash collectors.	
Permanent contract (wJBTERM & wJBTERM1)	Respondent has a permanent contract	Question 19
Unemployed (wJBSTAT)	Respondent is unemployed	Question 20
Unemployed a year ago (wJBSTATl)	Respondent was unemployed a year ago	Derived from Question 21
Education (wQFA to wQFN)	Qualifications and degrees that respondent achieved. Respondents will be divided into two groups: individuals without a college degree and college graduates.	Question 22

3.4.2. Descriptive Statistics on Financial Optimism and Demographic Variables

In this section, descriptive statistics are provided to observe demographic characteristics of all the individuals and the head of the household in the BHPS sample. Statistics on measures of optimism are also provided. Descriptive statistics on individuals who are interviewed in 1995, 2000 and 2005 are displayed in Appendix 2, Appendix 3, and Appendix 4 respectively. In order to eliminate the effect of outliers, negative numbers and the highest 0.1% of the data in the savings, investment, personal debt, annual income, annual household income, home purchase price, current home value, and mortgage outstanding BHPS variables were dropped from my analysis. I also used logarithms of these variables to reduce the effect of large numbers. Although the data has been checked and cleaned to get rid of obvious mistakes in the surveying process such as a negative numbers for income, there might still be mistakes in data due to respondents' misunderstanding the survey questions or their inability or unwillingness to provide a true answer. However, the potential existence of such individual mistakes does not nullify the overall quality of the dataset and its suitability for UK-wide research (Institute for Social & Economic Research).

Table 5 Descriptive statistics on measures of financial optimism

This table reports the mean, standard deviations, minimum values, maximum values, and the number of observations of the three measures of financial optimism in this study. Numbers without brackets are the values for all the individuals in the BHPS. Numbers within brackets are for the head of the household only.

	All Individuals (Head of Household)									
	Mean		Sdv		Min		Max		N	
Heuristics of optimism										
Financial expectation	1.16	(1.12)	0.58	(0.56)	0	(0)	2	(2)	224624	(117335)
A priori optimism	0.12	(0.12)	0.81	(0.78)	-2	(-2)	2	(2)	224624	(117335)
A posteriori optimism	0.12	(0.11)	0.77	(0.76)	-2	(-2)	2	(2)	189065	(99698)

As shown in Table 5, the average score for all three optimism measures of the sample are 1.16, 0.12, and 0.12 respectively. These three scores indicate that the respondents on average are optimistic. *A priori optimism* has the highest standard deviation suggesting *A priori optimism* is the most volatile measure among the three measures.

Table 6 Descriptive statistics on demographics

This table reports the mean, standard deviations, minimum values, maximum values, and the number of observations of the demographic variables selected from the BHPS. The variables are grouped into Personal Characteristics, Wealth and Income, Employment Profile. Numbers without brackets are the values for all the individuals in the BHPS. Numbers within brackets are for the head of the household only.

	All Individuals (Head of Household)									
	Mean		Sdv		Min		Max		N	
Personal Characteristics										
Age	45.18	(50.57)	18.62	(17.93)	15	(15)	101	(100)	224624	(117335)
Male	0.46	(0.67)	0.50	(0.47)	0	(0)	1	(1)	223254	(116601)
Married	0.64	(0.60)	0.48	(0.49)	0	(0)	1	(1)	224624	(117335)
White	0.95	(0.96)	0.21	(0.20)	0	(0)	1	(1)	224624	(117335)
Healthy	0.90	(0.89)	0.30	(0.31)	0	(0)	1	(1)	209001	(109018)
Household size	2.87	(2.44)	1.39	(1.33)	1	(1)	14	(14)	224624	(117335)
Wealth and Income										
Total financial wealth	7089	(8788)	28339	(31805)	0	(0)	1400000	(1400000)	40479	(21200)
Total wealth	103127	(96040)	129100	(126141)	0	(0)	4100000	(4100000)	40479	(21200)
Annual income	11501	(14466)	11503	(12721)	0	(0)	149935	(149935)	224511	(117252)
Annual household income	26317	(22743)	19980	(18921)	0	(0)	242433	(242433)	224509	(117278)
Home ownership	0.71	(0.67)	0.45	(0.47)	0	(0)	1	(1)	224624	(117335)
Home purchase price	34082	(35516)	40867	(39693)	0	(0)	485000	(465000)	159545	(78495)
Current home value	125864	(121586)	111204	(107479)	0	(0)	1400000	(1400000)	159520	(78503)

Mortgage outstanding	29155	(27851)	47069	(45952)	0	(0)	740000	(740000)	145370	(71593)
Employment Profile										
Business ownership	0.10	(0.12)	0.30	(0.33)	0	(0)	1	(1)	224624	(117335)
Finance related occupation	0.05	(0.04)	0.21	(0.20)	0	(0)	1	(1)	224624	(117335)
Employment: permanent contract	0.52	(0.52)	0.50	(0.50)	0	(0)	1	(1)	224624	(117335)
Unemployed	0.04	(0.03)	0.19	(0.18)	0	(0)	1	(1)	224624	(117335)
Unemployed a year ago	0.03	(0.03)	0.18	(0.18)	0	(0)	1	(1)	224624	(117335)
Education: first degree or above	0.32	(0.34)	0.47	(0.48)	0	(0)	1	(1)	224624	(117335)

Table 6 shows that among personal characteristics, the average age of household heads is 50.6 and 67% of the head of the household are male. While for all the individuals in the sample, the average age is 45.1 years old and 46% are male on average. 64% of the respondents are married or living as a couple. 95% of the respondents are white and 90% think they have been healthy during the past year. The average household size is 2.87 people.

The average financial wealth for all individuals is £7,089 and the average of total wealth is £103,127. Average annual income is £11,501 and annual household income is £26,317. These income figures include both working and non-working respondents. 71% of the sample have owned their house or bought their property on a mortgage. The mean of the current home value is approximately £125,864 for people who are homeowners. The average mortgage they borrow is £29,155.

As for the employment profile of the respondents, 10% of them have their own business. 5% have an occupation that is finance or business related. 52% have a permanent contract while 4% are unemployed. 32% of the respondents have a first degree or above.

3.4.3. Time Trends in Financial Optimism and Demographics

Section 3.4.2 reveals a number of observations from the descriptive statistics in a panel without considering time effects. In this section, I describe time trends in optimism, demographics, and wealth level over the survey period from 1991 to 2007. All the variables are grouped and their values are scaled for graphical display.

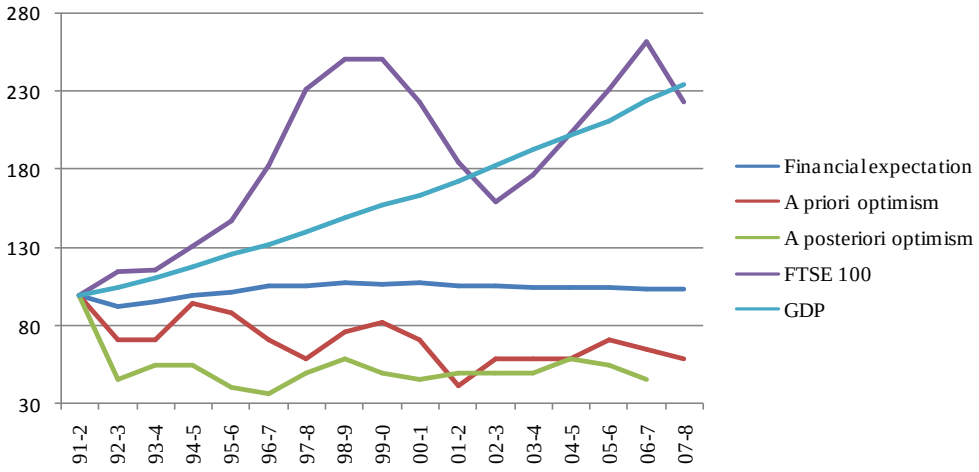
Table 7 Financial optimism, stock market, and GDP[1]

This table reports the time trends for measures of financial optimism as well as major economic benchmark (FTSE 100 and GDP of the country) from 1991 to 2007.

	91-2	92-3	93-4	94-5	95-6	96-7	97-8	98-9	99-0	00-1	01-2	02-3	03-4	04-5	05-6	06-7	07-8
Financial expectation	1.12	1.03	1.07	1.11	1.14	1.18	1.18	1.2	1.19	1.21	1.18	1.18	1.17	1.17	1.17	1.16	1.16
Change in financial situation last year	0.95	0.91	0.94	0.95	0.99	1.06	1.08	1.07	1.05	1.09	1.11	1.08	1.07	1.07	1.04	1.05	1.06
A priori optimism	0.17	0.12	0.12	0.16	0.15	0.12	0.10	0.13	0.14	0.12	0.07	0.10	0.10	0.10	0.12	0.11	0.10
A posteriori optimism	0.22	0.10	0.12	0.12	0.09	0.08	0.11	0.13	0.11	0.10	0.11	0.11	0.11	0.13	0.12	0.10	
FTSE 100	2521	2900	2919	3315	3711	4605	5833	6319	6313	5643	4656	4031	4464	5113	5833	6608	5626
GDP (£ in billions)	155	162	171	182	195	205	218	231	244	254	267	283	299	313	328	348	363

Figure 1 Financial optimism, stock market, and GDP

This figure shows the graphic interpretation of Table 7. Each differently coloured line represents one time trend of the variables listed in the first left column in Table 7.



[1] Data source: Bloomberg

In Table 7, the score for *Financial expectation* remains relatively stable. All the values for *Financial expectation*, *A priori optimism*, and *A posteriori optimism* suggest people on average are optimistic. In

Figure 1, *A priori optimism* and *A posteriori optimism* seem to be correlated with the movement of FTSE 100. The line representing *A priori optimism* is at a higher position and is more volatile than the line representing *A posteriori optimism* most of the time ($O_t^- > O_t^+$). This volatility is also reflected in the standard deviations of *A priori optimism* and *A posteriori optimism* in Table 5. This can be explained as respondents have been getting richer ($C_t^{t+1} > C_{t-1}^t$) based on Equation 1 and Equation 2, which is possibly due to the overall growth of the economy for most of the time. Only during the 2001 to 2002 period, is *A priori optimism* at a lower level than *A posteriori optimism* ($O_t^- < O_t^+$). This may be due to the information that was exposed to the economy causing the change in financial situation from 2000 to 2001 (C_{2000}^{2001}) of respondents to be greater than C_{2001}^{2002}. Interestingly, the period 2001 to 2002 coincides with the burst of the internet bubble. Therefore, it is understandable people's perception of the past year's financial situation (C_{2001}^{2002}) is more likely to be pessimistic. Overall, financial optimism seems to coincide with financial market booms and bursts.

Table 8 Wealth variables

This table reports the time trends for wealth variables including annual income, annual household income, total savings, total investment, and personal debt from 1991 to 2007. Savings, investment, and debt were only measured in 1995, 2000, and 2005 in the BHPS.

	91-2	92-3	93-4	94-5	95-6	96-7	97-8	98-9	99-0	00-1	01-2	02-3	03-4	04-5	05-6	06-7	07-8
Annual income	8009	8447	8636	9028	9495	10062	10124	10426	10552	11307	11633	12465	12901	13362	13831	14098	14654
Annual household income	18888	20074	20223	21218	22021	23523	23436	23991	23808	25450	26497	28505	29312	30260	31549	31937	33177
Total savings					3458					3130					3986		
Total investment					3778					2928					2830		
Personal debt					708					1233					1689		

Figure 2 Wealth variables

This figure shows the graphic interpretation of Table 8. Each differently coloured line represents one time trend of the variables listed in the first left column in Table 8.

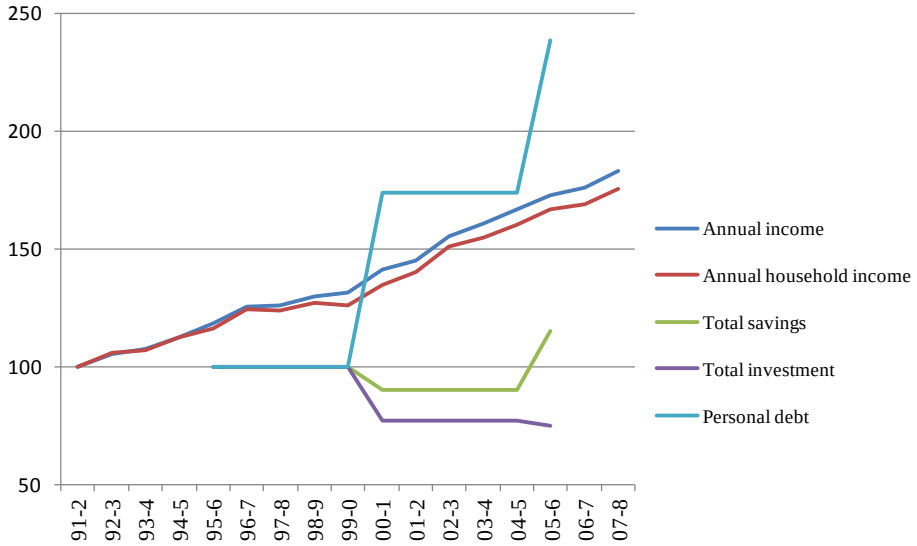


Table 8 displays a sparsely sampled trend of changes in respondents' savings, investment and personal debt since questions related to these wealth issues are only asked in 1995, 2000, and 2005 waves. Personal debt has a substantial increase since 1995 from £708 to £1,689 in 2005 on average, while investment decreased from £3,778 to £2,830. Savings decreased from £3,458 to £3,130 in 2000 then rose to £3,986 in 2005. I suspect the decreasing investment is probably due to increasing pressures on household finances. The sharp rise in the property prices limited individuals' financial recourses to invest in risk-free and risky assets. The details of trends in housing will be discussed in

Table 10. Individual and household annual income continues to increase from £8,009 to £14,654 for individuals and from £18,888 to £33,177 for households in 2007.

Table 9 Personal characteristics

This table reports the time trends for personal characteristics variables including age, gender, marital status, ethnicity, health status, and the size of the household from 1991 to 2007.

	91-2	92-3	93-4	94-5	95-6	96-7	97-8	98-9	99-0	00-1	01-2	02-3	03-4	04-5	05-6	06-7	07-8
Age	44.42	43.93	43.83	43.82	44.02	43.71	44.7	44.97	45.25	45.19	45.35	45.53	45.74	46	45.93	46.17	46.49
Male	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46
Married	0.65	0.64	0.64	0.64	0.64	0.64	0.63	0.64	0.64	0.64	0.64	0.64	0.64	0.65	0.64	0.64	0.64
White	0.94	0.94	0.94	0.94	0.95	0.95	0.94	0.95	0.96	0.96	0.96	0.96	0.97	0.97	0.96	0.95	0.95
Healthy	0.92	0.91	0.92	0.92	0.91	0.91	0.9	0.89		0.89	0.89	0.89	0.9	0.9	0.91	0.91	0.91
Household size	2.88	2.9	2.88	2.89	2.88	2.91	2.86	2.84	2.81	2.84	2.88	2.87	2.86	2.86	2.88	2.88	2.87

Figure 3 Personal characteristics

This figure shows the graphic interpretation of Table 9. Each differently coloured line represents one time trend of the variables listed in the first left column in Table 9.

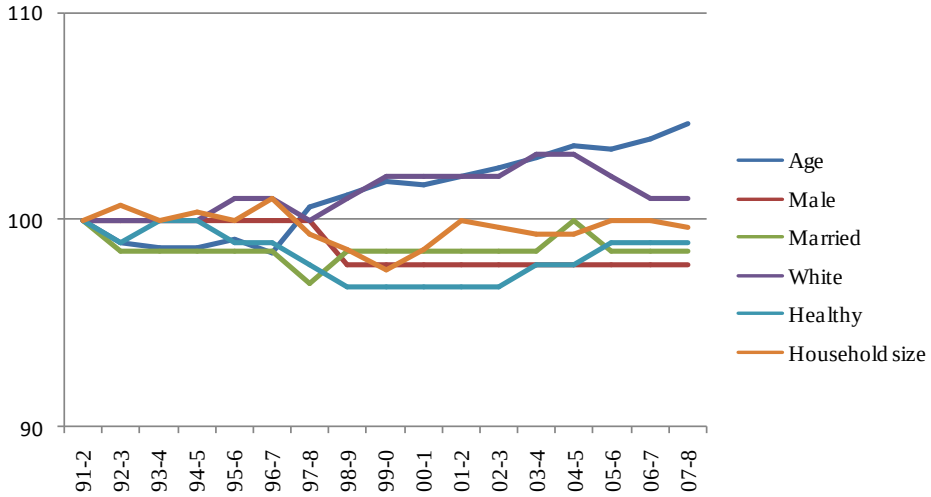


Figure 3 shows that the demographics of the respondents throughout 17 years remain stable. Table 9 shows that age rose from 44.42 in 1991 to 46.49 in 2007. The slight increase in the average age of the sample reflects the fact that large fraction of the sample is repeatedly surveyed during the period hence bringing up the overall age of the sample. 94% of respondents are white in 1991 then rose to 97% in 2004. From 2004 to 2007, more ethnic minorities have been included in the survey (3% to 5%). During 1998 to 2002, 89% of people think they are healthy compared to above 90% for the rest of the years.

Table 10 Home ownership and property value

This table reports the time trends for housing variables including home ownership, home purchase value, home value, and outstanding mortgage from 1991 to 2007. Outstanding mortgage was measured from 1993 onwards.

	91-2	92-3	93-4	94-5	95-6	96-7	97-8	98-9	99-0	00-1	01-2	02-3	03-4	04-5	05-6	06-7	07-8
Home ownership	0.7	0.71	0.69	0.7	0.7	0.71	0.66	0.67	0.68	0.69	0.7	0.72	0.73	0.72	0.75	0.75	0.75
Home purchase price	30421	30248	30240	30202	30755	30613	31379	32191	33415	33414	33760	34435	34705	36169	36946	38797	41023
Current home value	81509	82322	76455	76920	76631	79883	84367	91074	92870	102079	110539	133575	153102	175593	188684	206678	232374
Mortgage outstanding			20888	21770	23082	22499	24878	25386	24086	25341	25384	28125	31023	35030	35174	38453	41336

Figure 4 Home ownership and property value

This figure shows the graphic interpretation of
Table 10. Each differently coloured line represents one time trend of the variables listed in the first left column in
Table 10.

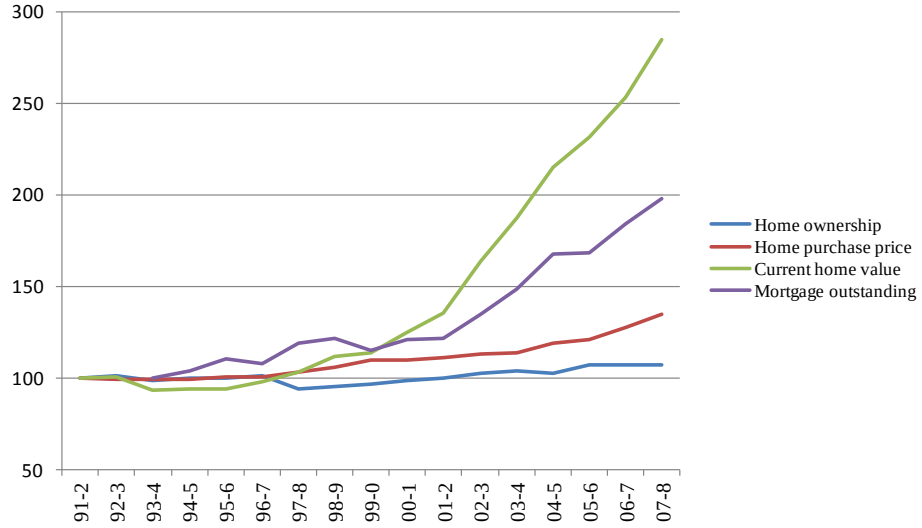


Figure 4 illustrates the dramatic increase in property price, property value and also the mortgage people have to take on in order to fund their home while the rate of home ownership keeps stable (around 71%).

Table 10 shows the average property value increases from £81,509 in 1991 to £232,374 in 2007. The average mortgage people have to take on to fund their housing rose from £20,888 to £41336 in 2007. This increasing trend in property price and value is consistent with the 10-year property market boom in the UK since 1997[1].

Table 11 Education and employment

This table reports the time trends education and employment variables including educational qualifications, employment types, employment status, and whether working in finance related occupations from 1991 to 2007.

[1] https://www.express.co.uk/posts/view/33589

	91-2	92-3	93-4	94-5	95-6	96-7	97-8	98-9	99-0	00-1	01-2	02-3	03-4	04-5	05-6	06-7	07-8
Education: first degree or above	0.21	0.23	0.24	0.26	0.27	0.29	0.28	0.3	0.3	0.32	0.31	0.34	0.35	0.36	0.37	0.38	0.4
Employment: permanent contract	0.53	0.53	0.5	0.51	0.51	0.52	0.51	0.53	0.52	0.53	0.52	0.53	0.53	0.54	0.53	0.53	0.53
Business ownership	0.11	0.11	0.11	0.11	0.11	0.12	0.11	0.11	0.1	0.09	0.09	0.09	0.09	0.1	0.1	0.1	0.1
Unemployed	0.05	0.06	0.06	0.05	0.04	0.04	0.04	0.03	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.03
Unemployed a year ago	0.04	0.05	0.05	0.05	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.03	0.02
Finance related occupation	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.04	0.05	0.04	0.04	0.04	0.04	0.04	0.05	0.05

Figure 5 Education and employment

This figure shows the graphic interpretation of Table 11. Each differently coloured line represents one time trend of the variables listed in the first left column in Table 11.

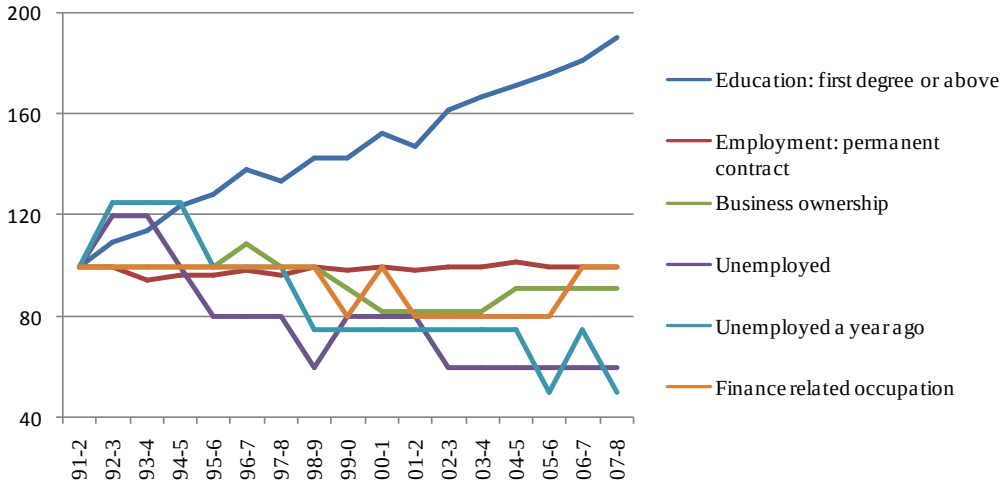


Figure 5 provides information regarding the trend of respondents' education level and employment profiles. According to Table 11, the number of people with a first degree or above has a large increase from only 21% in 1991 to 40% in 2007, while the overall unemployment rate has dropped from 5% to 3%. Since 1998, there are two peaks (2000 and 2006) where 1% more people took finance related jobs which overlapped with financial market booms. This suggests that when financial markets are thriving, financial occupations appear more attractive to people or the industry creates more job opportunities. The percentage of people who have permanent contracts remain constantly (52%) throughout the years.

3.4.4. Correlations between Optimism and Demographics

In this section, the correlations between optimism and demographic variables are examined to provide a brief insight into the relationship between different measures of optimism and various

demographic variables from the BHPS.

Table 12 Correlations between financial optimism and demographics

Optimism measures and the selected demographic variables and are listed in the left column. The rest of the columns reports Pearson's r (with significance under each coefficient) between these variables and variables listed in the first row.

	Financial expectation	A priori optimism	A posteriori optimism	Savings	Investment	Debt	Age	Male	Married
Financial expectation	1.0000	0.5503 0.0000	0.5227 0.0000	-0.0682 0.0000	-0.0294 0.0000	0.1140 0.0000	-0.2923 0.0000	0.0474 0.0000	-0.0311 0.0000
A priori optimism	0.5503 0.0000	1.0000	0.4414 0.0000	-0.0483 0.0000	-0.0146 0.0048	0.0717 0.0000	-0.0611 0.0000	0.0165 0.0015	0.0041 0.4284
A posteriori optimism	0.5227 0.0000	0.4414 0.0000	1.0000	-0.0325 0.0000	-0.0056 0.2842	0.0499 0.0000	-0.0747 0.0000	0.0112 0.0314	0.0130 0.0124
Savings	-0.0682 0.0000	-0.0483 0.0000	-0.0325 0.0000	1.0000	0.2954 0.0000	-0.0416 0.0000	0.1761 0.0000	0.0409 0.0000	0.0488 0.0000
Investment	-0.0294 0.0000	-0.0146 0.0048	-0.0056 0.2842	0.2954 0.0000	1.0000	-0.0088 0.0907	0.1302 0.0000	0.0455 0.0000	0.0369 0.0000
Debt	0.1140 0.0000	0.0717 0.0000	0.0499 0.0000	-0.0416 0.0000	-0.0088 0.0907	1.0000	-0.1503 0.0000	0.0854 0.0000	0.0441 0.0000
Age	-0.2923 0.0000	-0.0611 0.0000	-0.0747 0.0000	0.1761 0.0000	0.1302 0.0000	-0.1503 0.0000	1.0000	-0.0271 0.0000	0.1054 0.0000
Male	0.0474 0.0000	0.0165 0.0015	0.0112 0.0314	0.0409 0.0000	0.0455 0.0000	0.0854 0.0000	-0.0271 0.0000	1.0000	0.0711 0.0000
Married	-0.0311 0.0000	0.0041 0.4284	0.0130 0.0124	0.0488 0.0000	0.0369 0.0000	0.0441 0.0000	0.1054 0.0000	0.0711 0.0000	1.0000
White	-0.0195 0.0002	-0.0149 0.0040	-0.0140 0.0070	0.0402 0.0000	0.0292 0.0000	0.0141 0.0065	0.0856 0.0000	-0.0256 0.0000	0.0360 0.0000
Healthy	0.0473 0.0000	-0.0356 0.0000	-0.0145 0.0053	0.0421 0.0000	0.0309 0.0000	0.0172 0.0009	-0.1142 0.0000	0.0446 0.0000	0.0390 0.0000
Household size	0.1151 0.0000	0.0267 0.0000	0.0493 0.0000	-0.1123 0.0000	-0.0828 0.0000	0.0632 0.0000	-0.4446 0.0000	0.0284 0.0000	0.2263 0.0000
Total financial wealth	-0.0568 0.0000	-0.0359 0.0000	-0.0211 0.0000	0.7374 0.0000	0.8631 0.0000	-0.0282 0.0000	0.1852 0.0000	0.0538 0.0000	0.0519 0.0000
Total wealth	-0.0422 0.0000	-0.0340 0.0000	-0.0186 0.0003	0.3015 0.0000	0.3158 0.0000	0.0492 0.0000	0.0897 0.0000	0.0323 0.0000	0.1467 0.0000
Annual income	0.0424 0.0000	-0.0249 0.0000	-0.0090 0.0834	0.1843 0.0000	0.1582 0.0000	0.2146 0.0000	-0.0121 0.0199	0.2611 0.0000	0.1604 0.0000
Annual household income	0.0807 0.0000	-0.0476 0.0000	-0.0103 0.0469	0.1094 0.0000	0.0861 0.0000	0.1713 0.0000	-0.2346 0.0000	0.0691 0.0000	0.1988 0.0000
Home ownership	-0.0295 0.0000	-0.0321 0.0000	-0.0325 0.0000	0.1135 0.0000	0.0940 0.0000	0.0425 0.0000	0.0469 0.0000	0.0397 0.0000	0.2033 0.0000
Home purchase price	0.0299 0.0000	0.0023 0.6579	0.0033 0.5289	0.0979 0.0000	0.0883 0.0000	0.1008 0.0000	-0.0662 0.0000	0.0146 0.0048	0.1862 0.0000
Current home value	-0.0332 0.0000	-0.0288 0.0000	-0.0154 0.0030	0.1696 0.0000	0.1592 0.0000	0.0579 0.0000	0.0575 0.0000	0.0233 0.0000	0.1449 0.0000
Mortgage outstanding	0.1022 0.0000	0.0159 0.0022	0.0190 0.0002	-0.0142 0.0061	-0.0064 0.2198	0.2136 0.0000	-0.2321 0.0000	0.0243 0.0000	0.1522 0.0000
Business ownership	0.0568 0.0000	0.0149 0.0041	0.0307 0.0000	0.0233 0.0000	0.0215 0.0000	0.0589 0.0000	-0.0364 0.0000	0.1423 0.0000	0.0818 0.0000
Finance related occupation	0.0475 0.0000	-0.0099 0.0560	-0.0022 0.6666	0.0171 0.0010	0.0224 0.0000	0.0574 0.0000	-0.0813 0.0000	-0.0131 0.0116	0.0515 0.0000
Employment: permanent contract	0.1614 0.0000	-0.0338 0.0000	0.0330 0.0000	-0.0329 0.0000	-0.0450 0.0000	0.1886 0.0000	-0.3701 0.0000	0.1106 0.0000	0.1689 0.0000
Unemployed	0.0881 0.0000	0.1498 0.0000	0.0618 0.0000	-0.0331 0.0000	-0.0245 0.0000	-0.0211 0.0000	-0.1103 0.0000	0.0476 0.0000	-0.0680 0.0000
Unemployed a year ago	0.0553 0.0000	0.0316 0.0000	0.0403 0.0000	-0.0335 0.0000	-0.0265 0.0000	-0.0256 0.0000	-0.0939 0.0000	0.0546 0.0000	-0.0650 0.0000
Education: first degree or above	0.0818 0.0000	0.0095 0.0675	0.0117 0.0244	0.1098 0.0000	0.1027 0.0000	0.1622 0.0000	-0.1059 0.0000	0.0809 0.0000	0.1107 0.0000

Table 12 Correlations between financial optimism and demographics

Optimism measures and the selected demographic variables and are listed in the left column. The rest of the columns reports Pearson's r (with significance under each coefficient) between these variables and variables listed in the first row.

	White	Healthy	Household size	Total financial wealth	Total wealth	Annual income	Annual household income	Home ownership	Home purchase price
Financial expectation	-0.0195	0.0473	0.1151	-0.0568	-0.0422	0.0424	0.0807	-0.0295	0.0299
	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
A priori optimism	-0.0149	-0.0356	0.0267	-0.0359	-0.0340	-0.0249	-0.0476	-0.0321	0.0023
	0.0040	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.6579
A posteriori optimism	-0.0140	-0.0145	0.0493	-0.0211	-0.0186	-0.0090	-0.0103	-0.0325	0.0033
	0.0070	0.0053	0.0000	0.0000	0.0003	0.0834	0.0469	0.0000	0.5289
Total savings	0.0402	0.0421	-0.1123	0.7374	0.3015	0.1843	0.1094	0.1135	0.0979
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total investment	0.0292	0.0309	-0.0828	0.8631	0.3158	0.1582	0.0861	0.0940	0.0883
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Personal debt	0.0141	0.0172	0.0632	-0.0282	0.0492	0.2146	0.1713	0.0425	0.1008
	0.0065	0.0009	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Age	0.0856	-0.1142	-0.4446	0.1852	0.0897	-0.0121	-0.2346	0.0469	-0.0662
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0199	0.0000	0.0000	0.0000
Male	-0.0256	0.0446	0.0284	0.0538	0.0323	0.2611	0.0691	0.0397	0.0146
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0048
Married	0.0360	0.0390	0.2263	0.0519	0.1467	0.1604	0.1988	0.2033	0.1862
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
White	1.0000	0.0070	-0.1195	0.0419	-0.0028	0.0592	-0.0085	-0.0013	0.0074
		0.1756	0.0000	0.0000	0.5936	0.0000	0.1023	0.7966	0.1559
Healthy	0.0070	1.0000	0.0657	0.0441	0.1035	0.0902	0.1206	0.1165	0.0751
	0.1756		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Household size	-0.1195	0.0657	1.0000	-0.1179	0.0680	-0.0198	0.3289	0.0697	0.0508
	0.0000	0.0000		0.0000	0.0000	0.0001	0.0000	0.0000	0.0000
Total financial wealth	0.0419	0.0441	-0.1179	1.0000	0.3826	0.2093	0.1187	0.1265	0.1142
	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total wealth	-0.0028	0.1035	0.0680	0.3826	1.0000	0.2952	0.4384	0.5250	0.4237
	0.5936	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000
Annual income	0.0592	0.0902	-0.0198	0.2093	0.2952	1.0000	0.5599	0.1873	0.2915
	0.0000	0.0000	0.0001	0.0000	0.0000		0.0000	0.0000	0.0000
Annual household income	-0.0085	0.1206	0.3289	0.1187	0.4384	0.5599	1.0000	0.3044	0.3066
	0.1023	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000
Home ownership	-0.0013	0.1165	0.0697	0.1265	0.5250	0.1873	0.3044	1.0000	0.3245
	0.7966	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000
Home purchase price	0.0074	0.0751	0.0508	0.1142	0.4237	0.2915	0.3066	0.3245	1.0000
	0.1559	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Current home value	-0.0115	0.1007	0.0961	0.2022	0.9822	0.2703	0.4405	0.5308	0.4259
	0.0272	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mortgage outstanding	-0.0106	0.0760	0.1470	-0.0120	0.3315	0.3169	0.4116	0.2955	0.3903
	0.0404	0.0000	0.0000	0.0205	0.0000	0.0000	0.0000	0.0000	0.0000
Business ownership	-0.0134	0.0509	0.0496	0.0275	0.1038	0.0759	0.0499	0.0622	0.0793
	0.0096	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Finance related occupation	0.0007	0.0299	0.0032	0.0249	0.0629	0.1419	0.1145	0.0703	0.1019
	0.8934	0.0000	0.5363	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Employment: permanent contract	0.0484	0.1805	0.1550	-0.0492	0.0660	0.4295	0.3592	0.1781	0.1808
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Unemployed	-0.0318	-0.0069	0.0460	-0.0348	-0.0779	-0.0927	-0.0684	-0.1121	-0.0614
	0.0000	0.1805	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Unemployed a year ago	-0.0212	-0.0050	0.0327	-0.0365	-0.0856	-0.0951	-0.0815	-0.1207	-0.0564
	0.0000	0.3337	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Education: first degree or above	0.0179	0.0842	-0.0007	0.1307	0.2187	0.3775	0.2766	0.1542	0.2246
	0.0005	0.0000	0.8958	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table 12 Correlations between financial optimism and demographics

Optimism measures and the selected demographic variables and are listed in the left column. The rest of the columns reports Pearson's r (with significance under each coefficient) between these variables and variables listed in the first row.

	Current home value	Mortgage outstanding	Business ownership	Finance related occupation	Employment: permanent contract	Unemployed	Unemployed a year ago	Education: first degree or above
Financial expectation	-0.0332	0.1022	0.0568	0.0475	0.1614	0.0881	0.0553	0.0818
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
A priori optimism	-0.0288	0.0159	0.0149	-0.0099	-0.0338	0.1498	0.0316	0.0095
	0.0000	0.0022	0.0041	0.0560	0.0000	0.0000	0.0000	0.0675
A posteriori optimism	-0.0154	0.0190	0.0307	-0.0022	0.0330	0.0618	0.0403	0.0117
	0.0030	0.0002	0.0000	0.6666	0.0000	0.0000	0.0000	0.0244
Total savings	0.1696	-0.0142	0.0233	0.0171	-0.0329	-0.0331	-0.0335	0.1098
	0.0000	0.0061	0.0000	0.0010	0.0000	0.0000	0.0000	0.0000
Total investment	0.1592	-0.0064	0.0215	0.0224	-0.0450	-0.0245	-0.0265	0.1027
	0.0000	0.2198	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Personal debt	0.0579	0.2136	0.0589	0.0574	0.1886	-0.0211	-0.0256	0.1622
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Age	0.0575	-0.2321	-0.0364	-0.0813	-0.3701	-0.1103	-0.0939	-0.1059
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Male	0.0233	0.0243	0.1423	-0.0131	0.1106	0.0476	0.0546	0.0809
	0.0000	0.0000	0.0000	0.0116	0.0000	0.0000	0.0000	0.0000
Married	0.1449	0.1522	0.0818	0.0515	0.1689	-0.0680	-0.0650	0.1107
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
White	-0.0115	-0.0106	-0.0134	0.0007	0.0484	-0.0318	-0.0212	0.0179
	0.0272	0.0404	0.0096	0.8934	0.0000	0.0000	0.0000	0.0005
Healthy	0.1007	0.0760	0.0509	0.0299	0.1805	-0.0069	-0.0050	0.0842
	0.0000	0.0000	0.0000	0.0000	0.0000	0.1805	0.3337	0.0000
Household size	0.0961	0.1470	0.0496	0.0032	0.1550	0.0460	0.0327	-0.0007
	0.0000	0.0000	0.0000	0.5363	0.0000	0.0000	0.0000	0.8958
Total financial wealth	0.2022	-0.0120	0.0275	0.0249	-0.0492	-0.0348	-0.0365	0.1307
	0.0000	0.0205	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total wealth	0.9822	0.3315	0.1038	0.0629	0.0660	-0.0779	-0.0856	0.2187
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Annual income	0.2703	0.3169	0.0759	0.1419	0.4295	-0.0927	-0.0951	0.3775
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Annual household income	0.4405	0.4116	0.0499	0.1145	0.3592	-0.0684	-0.0815	0.2766
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Home ownership	0.5308	0.2955	0.0622	0.0703	0.1781	-0.1121	-0.1207	0.1542
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Home purchase price	0.4259	0.3903	0.0793	0.1019	0.1808	-0.0614	-0.0564	0.2246
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Current home value	1.0000	0.3538	0.1044	0.0616	0.0800	-0.0755	-0.0833	0.2053
		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mortgage outstanding	0.3538	1.0000	0.0876	0.1116	0.2638	-0.0380	-0.0442	0.2112
	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Business ownership	0.1044	0.0876	1.0000	-0.0182	0.1481	-0.0357	-0.0139	0.0726
	0.0000	0.0000		0.0005	0.0000	0.0000	0.0075	0.0000
Finance related occupation	0.0616	0.1116	-0.0182	1.0000	0.1685	-0.0398	-0.0187	0.0597
	0.0000	0.0000	0.0005		0.0000	0.0000	0.0003	0.0000
Employment: permanent contract	0.0800	0.2638	0.1481	0.1685	1.0000	-0.1952	-0.0816	0.2605
	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000
Unemployed	-0.0755	-0.0380	-0.0357	-0.0398	-0.1952	1.0000	0.4952	-0.0350
	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000
Unemployed a year ago	-0.0833	-0.0442	-0.0139	-0.0187	-0.0816	0.4952	1.0000	-0.0300
	0.0000	0.0000	0.0075	0.0003	0.0000	0.0000		0.0000
Education: first degree or above	0.2053	0.2112	0.0726	0.0597	0.2605	-0.0350	-0.0300	1.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	

Table 12 shows that the three measures of financial optimism, *Financial expectation*, *A priori optimism*, and *A posteriori optimism*, are strongly correlated as shown in the above table, which implies these measures are indeed measuring the same effect but capture different aspects of optimism. Being optimistic significantly correlates with the amount of savings (-0.07, -0.05, and -0.03 for the three measures of optimism respectively). All three measures of financial optimism are also significantly negatively related to the one's investment (-0.03, -0.01 and -0.01 respectively). Optimism is also positively correlated with borrowing unsecured debt with the coefficients of 0.11, 0.07, and 0.05 for *Financial expectation*, *A priori optimism* and *A posteriori optimism* respectively. These results suggest people who are optimistic about their financial situation might actually have lower savings investment, but higher debt than non-optimistic respondents.

Table 12 also reveals some interesting correlations among the demographics. Individuals who have more savings also have more investment (0.30) but they borrow less personal debt (-0.04). Age is 18% positively correlated with savings and 13% positively correlated with investment. Males have higher level of investment (0.05) but at the same time they borrow higher debt (0.09). Being married is 5% positively correlated with total savings and 4% positively correlated with the amount in investment. Caucasians are less optimistic but they have higher level of savings (0.04) and investment (0.03). Being healthy is positively correlated with savings (0.04), investment (0.03) and debt level (0.02). The bigger the household the smaller amount of savings (-0.11) and investment (-0.08) they possess, but a large household also mean they purchase more expensive homes (0.05) and have higher household annual incomes (0.33).

Annual income contributes significantly to one's savings (18%), investment (16%), and debt level (21%). The purchase price of a property is 39% positively correlated with outstanding mortgage and 43% positively correlated with the property's value. People who have higher

educational qualifications have significantly higher savings (0.11) and investment (0.10), they are also more likely to borrow debt (0.16). Higher the education an individual has the more likely she has a permanent contract (0.26) and less likely she is unemployed (-0.04). If a person has a permanent contract, it is likely she has higher income (0.43) than someone without a permanent contract. People who were unemployed a year ago are likely to continue being unemployed for the following year (0.50).

3.5. Conclusion

In this chapter, I introduced the BHPS data set from which variables are selected and analyzed in this and following chapters. I generated scores for financial optimism measures (*Financial expectation*, *A priori optimism*, and *A posteriori optimism*) proposed in Chapter 2 and provided descriptive statistics and frequency distributions on optimism measures. The contribution of this chapter is that: (1) the measures of optimism capture financial optimism among individuals of the BHPS, (2) these measures of financial optimism have never been used before in other similar studies on household portfolio studies, (3) by calculating the frequency distribution of the measures of optimism, the respondents in this large survey are found to be more optimistic than pessimistic on average for all three optimism measures, and (4) it revealed interesting relationships among demographic variables and financial optimism.

By analysing the descriptive statistics of the BHPS variables, I found that the average age of household heads is 50.6 compared to 45.2 for all the individuals in the survey. The average financial wealth for all individuals is £7,089 and the average of total wealth is £103,127. Average amount of unsecured debt of all individuals is £1,378 and the head of the household borrows even more at £1,533. 10% of the survey respondents have their own business. 52% have permanent contracts while 4% are unemployed. 32% of the respondents have a first degree or above.

Times trends of the variables shows that *A priori optimism* and *A posteriori optimism* seem correlated with the movement of FTSE 100, which indicates financial optimism seems to coincide with financial market boom and burst. Personal debt has a substantial increase since 1995 from £746 to £1,843 in 2005 on average for all the respondents. I find that Personal characteristics such as age, gender, marital status, and individuals' health situation remain stable

throughout the survey period while income, property price and value rose sharply from 1991 to 2007. The number of people who have higher educational qualifications also increased significantly while unemployment decreased throughout the years.

I also investigated the correlations among optimism and demographics. Being optimistic is significantly correlated with reduced levels of savings and investment. The correlation coefficients are significant for three measures of optimism. All three measures of financial optimism are positively correlated with borrowing unsecured personal debt. Wealth variables are highly positively correlated with each other. Higher income positively correlates with savings and investment. Age, being male or being healthy is positively correlated with savings and investment. Larger households have higher household income but less savings and investment. Working in the finance industry or having higher educational level increases job security, and job security is positively correlated to higher income. People who were unemployed a year ago are highly likely to continue being unemployed for the following year.

In the next chapter, I will investigate the relationship between financial optimism and investment choices for the individuals in the BHPS by conducting further tests with the BHPS data.

Chapter 4

Optimism and Portfolio Choice

4.1. Introduction

The previous chapter introduced the British Household Panel Survey (BHPS) and preliminarily examined the data that is used for the survey-based analysis in this thesis. The objective of this chapter is to test the effect of optimism, more specifically financial optimism, on household portfolio choice by employing data from the BHPS. The layout of this chapter is as follows.

Section 4.2 summarises the literature on optimism and financial decision making, followed by detailed literature on the effect of demographic determinants on household portfolio choice. Demographics are grouped in to three categories: (1) personal characteristics, (2) wealth and income, and (3) employment profile. These demographic variables are used as control variables in this chapter.

Section 4.3 proposes the research hypothesis of this chapter. The rationale behind my hypothesis is also stated. Section 4.4 first re-introduces the BHPS data set that is employed in the chapter and the definitions of financial optimism, namely *Financial expectation*, *A priori optimism*, and *A posteriori optimism*, which were discussed in detail in chapter 3. Then the definitions of portfolio choice are provided. The descriptive statistics on portfolio choice are displayed. The chapter then introduces the methodology and regression models for the analysis.

Findings of this chapter are reported in Section 4.5. I present a general profile of an optimist in the survey in terms of the average values of their financial and demographic characteristics by analysing the BHPS data. Comparisons are then carried out in order to find whether there are any significant differences between optimist, pessimists, and neutral respondents. I found optimists are significantly younger, more likely to be male, have higher educational qualifications, are more likely to have business ownership, but have lower accumulated wealth

than pessimistic or neutral respondents.

I also found in section 4.5 that financial optimism has a positive influence on households' investment in risky portfolios and a negative impact on their preferences of risk-free portfolios when controlled on other demographic and wealth variables. Financially optimistic individuals also borrow more debt than non-optimistic ones, indicating they have higher risk preferences for their portfolios. Section 4.6 concludes this chapter.

I believe that research conducted in this chapter has four major contributions. First, the innovative measures of financial optimism have never been used before in any other research linking optimism and household portfolio choice. Second, this chapter fills a void in the published research on the effect of financial optimism on household portfolio choice, and this research attempts to strengthen the relationship between psychology and economics. Third, since the household sector is one of the four primary sectors in the macro-economy, research findings from studying optimism of household portfolio choice could help society to recognise the allocation of household finances. This study has implications in trying to rationalise normal individuals' investment behaviour as well as help individuals realise the positive and negative functions of financial optimism. Last but not least, this study employs UK household data which has not been used in any previous research on the relationship between optimism and household portfolio choice, therefore it provides interesting results which can be compared to that from Puri and Robinson (2007) who conducted a similar study in the US.

4.2. Literature Review

This literature review section contains an overview of the existing published literature on optimism and the demographic determinants that influence household portfolio choice. Section 4.2.1 summarises literature on the effect of optimism on financial decision-making and points out the lack of a large scaled study on the effects of financial optimism on household portfolio choice. Section 4.2.2 reviews a series of household demographic variables that have been proven to influence household portfolio choice. These demographical effects will be controlled in my study in order to analyse the effect of optimism on household portfolio choice which is the main focus of this chapter. The summary of the literature review is in section 4.2.3.

4.2.1. Optimism and Financial Decision Making

I reviewed in Chapter 2 the findings that optimism affect individuals' decision making in various social domains. In particular, among studies on the impact of behavioural issues in the economy, optimism is found to have effects on a number of economic phenomena (Puri and Robinson, 2007). Researchers claim that optimism can affect corporate management financial decisions and entrepreneurs' behaviour (March & Shapira 1987; Gervais, Heaton and Odean, 2002; Heaton, 2002; Hackbarth, 2007); it has impact on asset management and investors, affecting asset pricing and causing under- and over-reaction of stock prices to events (Lee, Shleifer, and Thaler, 1991; Barberis, Shleifer and Vishny 1998); it plays an important role for the existence of financial intermediation (Coval and Thakor, 2005); and optimism influences consumer expenditures (Kacperczyk and Kominek, 2002).

However there is little evidence on the role that optimism plays in household portfolio choice.

As one of the four macroeconomic sectors[1], the household sector is the primary participant on the buy side of the product market and the financial market, as well as the sell side of the resource markets (Welch & Welch, 2006). The only empirical paper studying optimism and household economic choice is Puri and Robinson (2007).

Puri and Robinson (2007) study optimism and economic choices using the Survey of Consumer Finances (SCF). The survey does not ask respondents about optimism directly, but it asks respondents how long they expect to live. Puri and Robinson (2007) compare respondents' self-reported life expectancy to that implied by actuarial tables and use life expectancy miscalibration as their measure of optimism. They find that optimists work harder, expect to retire later, are more likely to own stocks and save more. They also find that moderate optimism correlates to reasonably sensible economic decisions while extreme optimism correlates to seemingly irrational decisions.

However, I suspect optimism in different life domains or different decisions making processes may not be the same. In other words, if one is optimistic about her life expectancy and health, it doesn't necessary mean one is optimistic about her financial situation and will invest more in the capital market. Though Puri and Robinson (2007) claim their "measure of optimism correlates with generalised positive expectations about the economy ... correlates with the individual's positive expectations of future income growth", although there is certain correlation between life expectancy miscalibration and expectations about the economy, their measure may not fully capture the optimism in individuals' financial situation. It is likely that life expectancy miscalibration is independent from the economic cycle and remains relatively stable throughout the life time, while investor optimism in investment decisions could change frequently with financial markets fluctuation and therefore leads to various financial decision

[1] They are the household sector, business sector, government, and the foreign sector (Salvatore & Diulio, 1995)

making biases.

Therefore, my research will be different from Puri and Robinson (2007) in three aspects: (1) measurement of optimism, (2) research focus and (3) data. Puri and Robinson (2007) use life expectancy miscalibration to measure individuals' optimism. However, using life expectancy miscalibration as the measurement of optimism may not fully capture optimism in one's financial situation. Therefore, I develop three measures of optimism, which are F*inancial expectation*, *A priori optimism* and *A posteriori optimism*, to capture the effect of financial optimism only. This study will focus on the effect of optimism on household portfolio choice instead of on a series of economic decisions and attitude toward life events as in Puri and Robinson (2007) whose study includes individuals' marriage decisions, attitudes towards retirement, and vocational choices. Focusing on only household portfolio choice is consistent with my measures for financial optimism since I believe it is more accurate to separately study the effect of optimism within each life domain, event or process. Moreover, this study will employ UK household data which has not been used before in similar studies and covers a longer period from 1991 to 2007 than Puri and Robinson (2007) who used US data from 1995 to 2001.

4.2.2. Demographic Determinants in Household Portfolio Choices

Demographics are the statistical characteristics of human populations. Studies have shown that a number of demographics such as age, gender, marital status, wealth, income, home and business ownership, occupation, and education level have an influence on individuals' portfolio choices (Morin and Suarez, 1983; Sunden and Surette, 1998; Cohn, Lewellen, Lease, and Schlarbaum, 1975; Heaton and Lucas, 2000; Giofré, 2009; Lusardi, 2003). Some of these demographics such as age represent the influence of life-cycle effects and the investor's life-cycle plays a prominent role in portfolio selection behaviour (Morin and Suarez, 1983).

Research on the effects of demographics on portfolio choice was based on samples drawn from various countries and these research findings are clear and statistically significant. The majority of research supports a positive relationship between risky asset ownership and wealth, income and education level, but a negative relationship between risky asset ownership and age. Female investors are less likely to invest in risky assets and marriage status affects individuals' portfolio choices. Ownership of businesses and a home has a negative effect on risky asset holdings. Finance related occupations also lead to an increase of stock ownership. There are mixed results on whether health status affects portfolio choice.

In the following sections, I categorize demographics into three categories - (1) personal characteristics; 2) wealth and income; and (3) employment profile. I also provide a literature review on the effect of each of the researched demographic variables in the three sections. These demographic variables will be used as control variables in the analysis of this study to isolate the effect of a particular behavioural factor – financial optimism, on portfolio choice.

4.2.2.1. Personal Characteristics

Effects of personal demographics on household portfolio choices are well researched. I use age, gender, marital status, ethnic group, household size, and health condition as control variables in my research.

(a) Age

The effects of individuals' life-cycle play an important role in individuals' financial choices (Morin and Suarez, 1983). Current financial wealth is likely to vary over the investor's life-cycle along with changing financial needs (Leece, 1999). The Life-cycle Hypothesis

assumed that households strive to maximize their utility of future consumption (Ando & Modigliani, 1957). Life-cycle Hypothesis is based on the idea that people tailor their consumption patterns to their needs at different ages, limited only by the resources available over their lives (Deaton, 2005). The hypothesis suggests people borrow or live off endowments in the early years, save and pay off debt in mid life, and live off savings in retirement (Stevens, 2004). This theory has important applications in macroeconomics, such as national saving depends on the rate of growth of the economy, and aggregate saving is determined by economic as well as demographic factors including the age structure of the population and the life expectation (Deaton, 2005; Ando & Modigliani, 1957).

As age structure represents different stages of human life-cycle, its influences on individual portfolio choice are constantly investigated by researchers. Morin and Suarez (1983) conduct an empirical investigation of the demand for risky assets of Canadian households using data from the 1970 Survey of Consumer Finances. Their results indicate that the investor's life-cycle plays a prominent role in portfolio selection behaviour with risk aversion increasing uniformly with age, as evidenced by the decreasing slope coefficients across age groups[1]. Particularly, in the low wealth group, the data suggests a pattern of increasing relative risk aversion. However, a slight decrease is found among wealthy households. They conclude that wealth remains as the most important variable but that investor life-cycle also plays a very important role.

Riley and Chow (1992) examine the hypothesised relationships between risk tolerance and various variables. Their findings indicate that risk aversion decreases with age but only up to a point. After age 65 (retirement), risk aversion increases significantly. Bakshi and Chen (1994) study the relationship between demographics and capital market returns as well as

[1] 5 age groups in total, including under 35 years of age, 35 to 44, 45 to 54, 55 to 64, and over 65 years of age

investments choices using annual economic data[1] for the period 1900-1990. They find a positive relationship between risk aversion and age. They also find an investor's asset mix changes with the life-cycle. When the population ages, the aggregate demand for financial investments rises compared to the demand for housing.

Viceira (2001) examines how retirement affects optimal portfolio choice and finds the optimal allocation to stocks is larger for employed investors than for retired investors. Increasing idiosyncratic labour income risk[2] raises investors' willingness to save and reduces their stock portfolio allocation towards the level of retired investors. His research shows that the optimal portfolio allocation to stocks is positively related to both expected labour income growth and expected retirement. Cocco, Gomes, and Maenhout (2005) find that the proportion of wealth invested in equities decreases with age. This is driven by the fact that their labour income profile is downward sloping. With an increase in age, they found an investor shifts his financial portfolio towards the risk-free asset. Cocco et al. (2005) claim their results support the investment advice given by popular finance books and financial counsellors, namely to shift the portfolio composition towards relatively safe assets as one ages.

Contrary to the above findings, Wang and Hanna (1998) find decreasing risk aversion as people age using the 1983-89 panel of the Survey of Consumer Finances. Despite the different sample data the researchers were using, the contradictory findings are more likely to be the outcomes caused by different methodologies they employed. First, Morin and Suarez (1983) excluded housing from the definition of net worth while Wang and Hanna (1998) included the value of real estate as risky assets. Second, Wang and Hanna (1998) use a heteroscedastic Tobit model instead of Ordinary Least Squares regression to avoid heteroscedasticity because they believe

[1] This dataset include demographic data, historical housing prices, and data on capital market returns that are available from a number of data sources, such as S&P500 index and CITIBASE (1992)

[2] Risk of retirement for age or permanent disability reasons that is independent of the business cycle

the Tobit model is more suitable in handling censoring.

In this research, age will be used as a control variable and is defined as "age at date of interview". Age is expected to have a negative effect on investment in risky portfolios.

(b) Gender

A number of studies investigate the gender differences in investment behaviour and have demonstrated that women invest their asset portfolios more conservatively than men, and they exhibit less financial risk-taking behaviour (Bajtelsmit & VanDerhei, 1997; Hinz, McCarthy, & Turner, 1997).

Bajtelsmit, Bernasek, and Jianakoplos (1999) estimate the coefficient of relative risk aversion based on the allocation of wealth into defined contribution pensions using data from the 1989 Survey of Consumer Finances. They find women are less likely than men to invest in risky assets such as stocks.

Jacobsen, Lee, & Marquering (2008) document a consistent and strikingly large gender difference in optimism using consumer confidence indices in eighteen countries. Men are found to be more optimistic than women over time and across most of countries. In particular, they show that in the US men are significantly more optimistic about the future economic conditions and stock market performance than women over the period 1978-2006 after controlling for income, employment, wealth, education and marital status.

I will control gender effects of the respondent in this study. I expect males are more likely to invest in risky portfolios than females.

(c) Marital Status

Cohn, Lewellen, Lease, and Schlarbaum (1975) find a negative correlation between risky asset ownership and marital status. Their analysis indicates that married individuals appear to invest smaller proportions of their portfolios in risky assets than do single individuals when other conditions, such as age, income, wealth, etc, being equal.

Riley and Chow (1992) find that individuals who have never married display a slightly lower risk aversion than married individual while widowed and separated individuals being the most risk averse among all three categories.

Bertocchi, Brunetti, & Torricelli (2009) find that single women in Italy have a lower propensity to invest in risky assets than married females and males based on data from the 1989-2006 Bank of Italy Survey of Household Income and Wealth. They find that towards the end of the sample period, a reduction in the gap between women with different family status was observed. This phenomenon can be explained by changes of women's perception of marriage - fewer women view marriage as a sort of safe asset. Their results suggest that the behaviour of women has been shaped by the transformation of the structure of family and society over the years.

Sunden and Surette (1998) examines whether workers differ systematically by gender in the allocation of assets in retirement plans by using data from the 1992 and 1995 Surveys of Consumer Finances (SCF). They find single women and married men are less likely than single men to choose a portfolio made up largely by stocks. Married women are more likely than single women to allocate assets in a portfolio consisting mainly bonds. They conclude that investment decisions seem to be driven by a combination of gender and marital status.

Lyons and Yilmazer (2006) investigate into married couples' investment behaviour by

employing data from the 1995, 1998, and 2001 Survey of Consumer Finances (SCF). Their results show that married women who have more control over the financial resources in the household are less likely to invest in risky assets. Also, women who are married to relatively older men are less likely to take on risk with their portfolios. There is little evidence that the characteristics of the wife, such as age, education level and occupation, affect the husband's investment decisions.

I will categorise respondents who are married and living as couples into the married group. Those who have never been married, widowed, divorced and are separated will be categorised into the unmarried group. The effect of marital status on portfolio choice seems complicated and affected by various factors based on previous literatures, therefore it is hard to predict what impact this variable would have on portfolio choice in this research.

(d) Ethnic Group

Soest and Kapetyn (2006) find in their American study that Hispanics and in particular, non-whites hold less financial and non-financial assets than others, while non-whites also have higher debts. However, the effect of ethnicity is not main focus in their study but this finding suggests ethnicity might have some influence on household portfolio choices since it has effects on household financial conditions.

All the respondents will be grouped into white or non-white. Based on the indication of Soest and Kapetyn (2006), white respondents might have higher financial wealth and are more likely to invest in risky assets but such effect might not be significant.

e) Health Condition

Rosen and Wu (2003) analyze data from 1990s' Health and Retirement Study (HRS) and find that health is a significant predictor of both the probability of owning different types of financial assets and the share of financial wealth held in each asset category. Poor health may influence an individual's marginal utility of consumption, her degree of risk aversion, and the variability of her labour income. Through these channels poor health is associated with a smaller share of financial wealth held in risky assets and a larger share in safe assets. However, Love and Smith (2007) question the connection between investor health condition and portfolio choice. By analysing data in newer waves of the HRS compared to Rosen and Wu (2003), Love and Smith (2007) find there is no statistically significant relationship between any of their health measures and household portfolio decisions after accounting adequately for the effects of unobserved heterogeneity. They suggest that the empirical relationship between health and portfolio choice is far less clear than previous studies conclude.

Health status over the last 12 months before the interview will be controlled in this study. The answer of "excellent, good, fair" will be considered as healthy and "poor or very poor" will be taken as unhealthy. I expect health has a positive impact on risky asset holdings in this research.

f) Household Size

In the analysis of determinants for the percentage of total assets invested in risky assets, family size is the second most important determinant next to wealth for households with less than $175,000 in assets according to Cohn, Lewellen, Lease, and Schlarbaum (1975). They also reveal that households with only one member invest 21% more funds in risky assets than households with more than one member.

The number of persons in the household when the interview took place will be controlled. It is not clear if household size would have a negative effect on choosing risky portfolios.

4.2.2.2. Wealth and Income

a) Wealth

Cass and Stiglitz (1972) have analyzed theoretically the effects of changes in wealth on risk-bearing behaviour in the presence of multiple risky assets. Empirical results yield by Cohn, Lewellen, Lease, and Schlarbaum (1975) proved that wealth is the most important determinant of household risky asset ownership among all demographics. As wealth increases, relative risk aversion decreases and the proportion of assets invested in risky instruments increases. Furthermore, this effect seems to hold throughout the entire range of wealth from households with total assets under $100,000 to over $350,000. Alessie, Hochguertel, and Soest (2000) find a strong positive relationship between wealth and ownership of risky assets, which is consistent with Cohn, et al. (1975).

Morin and Suarez (1983) also find evidence that that wealth remains the most important variable in determining household risky assets holdings. An increase in the relative holdings of risky assets with wealth level is well supported by the Canadian data. The conclusion holds whether wealth is defined exclusive of housing or whether housing is defined as a riskless asset. The only exception to this finding is that when attention is restricted to the lower wealth[1] population, a negative relationship is found between relative risky asset holdings and wealth. One explanation for this result is that the absence of any asset data on pension funds, life insurance, and other social benefits of a contractual nature is likely to be more relevant in the lower wealth groups and such exclusion of contractual savings data could lead to a biased

[1] $1-12,500

result.

Peress (2004) investigates wealth effect from a perspective of information. He argues that the cost of information deters less wealthy households from stock trading. He demonstrates that information generates increasing stock returns, decreasing absolute risk aversion and wealthier households are more likely to be able to afford costly information, therefore stocks are less risky for wealthier households and they invest a larger fraction of their wealth in risky assets. Ait-Sahalia, Parker, and Yogo (2004) also find that low net worth households do not participate in the stock market.

I will use household total savings and total investments as financial wealth control. It is expected that the higher the financial wealth an individual has higher the investment in her risky assets.

b) Income

According to Cohn et al (1975), regression results show that the risky-asset fraction of the portfolio is positively correlated with income. Brown and Taylor (2005) find that there is a positive association between financial assets and wage growth with this relationship becoming more pronounced over time. Palme, Sundén, and Söderlind (2005) show that the risk level of Swedish households' portfolios is positively related to income. But the relationship is actually somewhat U-shaped: participants with the lowest income take on as much risk as those with the highest income, which indicate that they are not diversifying their overall portfolio.

Cardak and Wilkins (2009) study various risk factors, such as labour income and health risk, and their influence on household asset allocation by using data collected by the Household, Income and Labour Dynamics in Australia (HILDA) survey. They measured labour income risk

by the coefficient of variation of household labour income over the five years following the initial survey. This measurement can account for the potential unobserved source of labour income uncertainty such as family structure changes. As a result, they find households reduce risky assets as a proportion of household financial asset portfolio when they face greater labour income risks which could be rising from poor health condition.

I will include level of individual income and household income of the respondent as income controls. I expect a positive relationship between income and investment in risky portfolios.

c) Home Ownership

The majority of published research has documented a negative relationship between the ownership of a home and risky asset ownership due to liquidity constraints.

Yao and Zhang (2005) find housing choice has a significant impact on portfolio choice. Their results show that investors owning a house hold a lower equity proportion in their net worth which includes bonds, stocks, and home equity. This reflects the substitution effect of home equity for risky stocks. Furthermore, following the policy of always renting leads investors to overweigh in stocks, while following the policy of always owning a house causes investors to underweight in stocks. Cocco (2005) concludes that due to the large investment needed for housing, younger investors have limited financial wealth to invest, which reduces their equity market participation. Shum and Faig (2006) also find that stock ownership is negatively correlated with holdings and willingness of investing in financial and non-financial assets, such as such as invest in own home.

A respondent's home ownership, the value and purchase price of her property and the total amount of her outstanding mortgage on the property she owns are my control variables. A

negative effect of home ownership on investment in risky asset is expected.

4.2.2.3. Employment Profile

a) Business Ownership

Faig and Shum (2002) argue that entrepreneurs invest less in risky assets because of liquidity constraints. This indicates that entrepreneurs may choose a safe financial portfolio to ensure a smooth continuation of their business projects. Individuals are more risk averse in their portfolio choice when financial assets are used to fund projects that have a substantial penalty for discontinuation or under investing in the final stages. In other words, once an individual has committed an initial investment in a project, he faces unfavourable consequences due to the lack of liquidity if the project is either abandoned or is continued on an inappropriate scale. Faig and Shum (2002) find that personal projects, such as a private business, have negative influence on risky assets holdings. Similar to Heaton and Lucas (2000), they find that households that are saving to invest in their own businesses have significantly safer financial portfolios. However Heaton and Lucas (2000) explain the reason of entrepreneurs holding safe portfolios is to diversify the idiosyncratic risk of their businesses.

I will look into whether the respondent is self-employed to control the effect of business ownership. It is possible business ownership has a negative impact on risky portfolio holdings.

b) Occupation

Christiansen, Joensen, and Rangvid (2007) apply detailed education information of individuals and find economists have a high probability of investing in stocks due to informational

advantages among the Danish population. One potential explanation to this phenomenon is that some investors are better able to gather and understand information about investment opportunities and stock markets than others; therefore their effective costs of stock market participation are lower. As a result, they will have a higher probability of participating in the stock market.

In this chapter, the effects of respondents with finance or economy related occupations will be isolated. Whether the respondent is unemployed or having a permanent contract will be used as employment controls. I expect people who have finance related occupation are more likely to invest in risky assets.

c) Education

Wang and Hanna (1998) find that higher the education the higher risky asset proportion among investors' wealth. Cohn et al (1975) also claim higher education level leads to higher portion of risky asset holdings. Riley and Chow (1992) find asset allocation to equity tends to increase with education. However, they suggest that education, income and wealth are all highly correlated, so the positive relationship between education and risky asset allocation may be a function of wealth rather than education. Lusardi (2003) finds low-education families hold neither high returns assets (stocks, IRAs, business equity) nor basic assets such as checking accounts. The effects of education might be due to less educated individuals having worse numeracy, knowledge of inflation and interest or knowledge about financial market products. The lack of understanding of economics and finance is a significant deterrent to stock ownership (Rooij, Lusardi and Alessie, 2007).

To control for education the respondents will be divided into two groups: individuals with and without a first degree or above. It is expected in this research that highly educated people are

more likely to invest in risky portfolios since they have a better knowledge and understanding of the financial market and investment tools.

4.2.3. Summary

This literature section summarises the previous findings on the relationship between optimism and economic decision making. It points out the lack of research on optimism and household portfolio choices. It emphasises on how my study is different from the very limited research on optimism and household portfolio choices.

The literature shows that demographics jointly affect household portfolio choices. The relationship between demographics and portfolio choice is relatively well researched. Research on the effects of demographics on portfolio choice was based on samples drawn from various countries and these research findings are statistically significant. The majority of research supports a positive relationship between risky assets ownership and income, wealth and education level but a negative relationship with age. Female investors are less likely to invest in risky assets and marriage status affects investors' portfolio choices. Business and home ownership home has a negative effect on risky assets holdings. In this research, the effects of demographic variables are expected to be consistent with findings in previous literature.

By employing data from the British Household Panel Survey, Leece (1999) reveals joint influences of demographic and wealth related variables including age, income, property ownership, and saving patterns on risky assets holdings. Using the same dataset, I plan to control the effects of such demographic variables in this analysis. Age, gender, marital status, ethnic group, household size, health condition, wealth, income, home and business ownership, occupation, and education level are going to be used as control variables in my research so I can isolate the effect of financial optimism on household portfolio choice.

4.3. Research Hypothesis

Published literature reviewed in the above sections demonstrated that optimism affects people's decision making. Weinstein and Lyon (1999) claim optimism about reaching goals could sustain motivation and help individuals to overcome obstacles. But at same time, optimistic biases lead to the neglect of risks and could do harm. Research in public health often finds that people who believe that their risk is lower than their peers are less likely to take precautions than those who acknowledge personal risk. In assessing the likelihood of future negative events, it is not so much that individuals believe that negative events will not happen, but rather that these events are less likely to happen to them (McKenna, 1993). Tennen and Affleck's (1987) study implies if one has positive expectancies about the future, then there is little tendency to worry about the potentially negative consequences of a risky decision.

Individuals, including corporate managers and financial professionals, consistently overestimate the probability of positive outcomes and therefore decide on risky business strategies or choose risky investment opportunities (Heaton, 2002; Camerer and Lovallo, 1999; Rosen, 2003; Lee, Shleifer, and Thaler, 1991). There is a wide spectrum of research on optimism in corporate finance and capital markets. However, there is little research on the role of optimism play in household portfolio choice. I suspect that the optimistic bias that affects corporate managers, entrepreneurs, and asset managers are likely to influence households in a very similar way. As optimistic business and finance professionals choose risky investment opportunities, households with an optimistic expectation of their future financial situation might also make more risky portfolio choices. I developed the following research hypothesis.

Hypothesis: Individuals who are optimistic about their financial situation prefer to invest in riskier portfolios.

4.4. Data and Methodology

This section explains how I define portfolio choice which includes risk-free portfolios, risky portfolios, and debt choices. It also introduces the regression models that are employed in my analysis of the relationship between financial optimism and household portfolio choices.

4.4.1. Data

I investigate the effect of optimism on portfolio choice at the individual and household level in the UK using the British Household Panel Survey (BHPS) data. I have introduced details of the BHPS in Chapter 3 and provided descriptive analysis on the selected BHPS variables. I also defined *Financial expectation*, *A priori optimism*, and *A posteriori optimism* as my measures for financial optimism by using the BHPS data in section 3.3.

4.4.2. Definitions of Portfolio Choices

This session discusses how the risk-free assets, risky assets, and debt choices are defined in this study by using the BHPS data. It also links my definitions to previous literature and gives explanations on the rationale of my definitions.

Cohn et al. (1975) state that the designation of risk-free and risky assets is a delicate matter. The important question, however, is not so much whether an asset is riskless, but whether the individual in his portfolio planning regards the stream of benefits the asset provides as free of relevant uncertainty. In this study, savings accounts and checking accounts are treated as risk-free assets while stocks and investments in funds are treated as risky assets following the existing literature (Riley and Chow, 1992; Viceira, 2001; Cocco et al., 2005; Puri and

Robinson, 2007). However, the treatment of bonds and residential property is potentially contentious as scholars vary in their opinions over the classification of bonds and property.

Government and corporate bonds are regarded as riskless assets by Cohn et al. (1975)[1] while Friend and Blume (1975) and Morin and Suarez (1983) considered bonds as risky assets. Based on the principals of macroeconomics, bonds carry credit risk which is the risk that the issuer will default or be unable to make further principal or interest payments. Default rates of corporate bonds have exceeded 10% in 1990-91, 2001-02 and 2009[2], perhaps justifying the decision in more recent research to regard corporate bonds as risky assets. There have also been many sovereign debt crises in the past with Russia (1998), Argentina (2002) and Greece (2012) being notable examples in the last 15 years. The current credit crunch and recession has significantly affected the world economy and there are continual threats by rating agencies to downgrade the debt rating of even major western economies such as the US, UK and Germany (Fligstein & Goldstein, 2011). Although no debt crises or defaults have recently occurred in any G8 country after the credit crunch, the cost of insuring against sovereign debt default has increased with Credit Default Swaps for US government debt rising by 25 times in just over a year. Similar trends have been evident in the UK and German government bond markets. Based on these factors, both government and corporate bonds will be regarded as risky assets in this study.

As for the classification of properties, Graves (1973) and Cohn et al. (1975) classify housing as a riskless asset because of the low uncertainty of the real stream of benefits it provides but Friend and Blume (1975) regard properties as risky assets. Although the UK has historically low interest rates after the 2006 credit crunch, the number of homes in the UK repossessed by

[1] Cohn et al. (1975) treated government bonds and corporate bonds as riskless and risky assets respectively, in other words, they have two definitions for risky assets.
[2] JP Morgan's Default Monitor released on June 29,2012 by Peter D. Acciavatti.

lenders is still approximately between 35,000 and 40,000 annually[1]. Homeowners will be even more likely to default on their mortgage payments and consequently lose their homes and initial deposits when interest rates increase from current abnormally low levels. The number of unemployed people has reached over two million[2] in recent years, hence homeowners are more likely to default on their mortgage payment and consequently lose their homes and initial deposits. I believe under the current economic conditions, properties could either be risk-free or risky assets for an investor depending on her planning horizon. Because there is not enough information indicating each investor's planning horizon in the survey or enough information to predict the probability of default on each mortgage, I am not able to decide if property is risky or risk-free asset for individuals but only treat property as a component of individuals' total wealth. Like in Cohn et al. (1975), two definitions of wealth will be used, namely total wealth (TW) which includes savings (SAV), investment (INV) and current value of personal residence (VPR), and financial wealth (FW) which includes only savings and investment.

The BHPS contains questions regarding how much savings[3] (SAV) and investment[4] (INV) an individual has in 1995, 2000, and 2005 (See Question 3, Question 4, and Question 5 in Appendix 1). Based on above discussion, the definitions for risk-free portfolios and risky portfolios can be summarized as follows.

Risk-free portfolios

- The amount of total savings:

1 Council of Mortgage Lenders data 2007-2011.
2 http://news.bbc.co.uk/1/hi/business/7947766.stm
3 Include savings with a bank, post office or building society, national savings bank (post office), TESSA only ISA or Cash ISA
4 Include shares (UK or foreign), stocks and shares ISA or PEP, premium bonds, unit trusts/investment trusts, national savings bonds, national savings certificates, and other investments such as gilts, government or company securities.

SAV = Savings (Variable definition 1)

- The ratio of risk-free assets to financial wealth:

  SAV/FW = Savings / (savings + investment) (Variable definition 2)

- The ratio of risk-free assets to total wealth:

  SAV/TW = Savings / (savings + investment + current estimated home value)

  (Variable definition 3)

Risky portfolios

- The amount of total investment:

  INV = Investment (Variable definition 4)

- The ratio of risky assets to financial wealth:

  INV/FW = Investment / (savings + investment) (Variable definition 5)

- The ratio of risky assets to total wealth:

  INV/TW = Investment / (savings + investment + current estimated home value)

  (Variable definition 6)

Debt was not treated as a part of portfolio choice in the previous literature (Cohn et al., 1975; Lee and Hanna, 1995; Guiso et al., 2004; Cocco et al., 2005). However, Morin and Suarez (1983) considered debt as a component in calculating an individual's net worth. They also argue that as household wealth increases, acquisition of risky assets is dominated by reduction of debt and mortgage. In the UK, the amount of debt borrowed by individuals and households has mounted to 16% of gross domestic product GDP due to the massive increase of the number of credit cards available and the rise of a range of financial institutions offering unsecured loans (Brown, Garino, Taylor, & Price, 2005). The choice of borrowing unsecured debt indicates the level of risk preference of the household (Brown, Garino, Simmons, & Taylor, 2008). Brown et al. (2008) find that higher the level of risk preference more unsecured debt a household would borrow. Therefore in this study, the effect of optimism on borrowing

unsecured debt borrowing and taking mortgage will be investigated as debt indicates individuals' risk preference.

The BHPS contains questions regarding how much personal debt an individual has in 1995, 2000, and 2005 as well as how much mortgage on all properties an individual owned since 1993. Unsecured personal debt (PD) is defined as debt a person owes apart from mortgages (See Question 6 in Appendix 1). Total debt (TD) is defined as the total amount of unsecured personal debt and outstanding mortgage (MG). The following expressions are used to define personal indebtedness.

Debt choices

- Level of unsecured personal debt:

  PD = Personal debt (Variable definition 7)

- Ratio of unsecured personal debt to total debt:

  PD/TD = Personal debt / (personal debt + mortgage outstanding)

  (Variable definition 8)

- Ratio of mortgage to total wealth:

  MG/TW = Mortgage / (savings + investment + current estimated home value)

  (Variable definition 9)

4.4.3. Descriptive Statistics for Portfolio Choices

This section presents the descriptive statistics on the portfolio choices made by all the individuals as well as the head of the household in the BHPS. Descriptive statistics for other selected BHPS variables can be found in section 3.4.2. Descriptive statistics on the portfolio choices and other demographic variables for individuals who are interviewed in 1995, 2000, and 2005 are displayed in Appendix 2, Appendix 3, and Appendix 4 respectively.

Table 13 Descriptive statistics of risk-free portfolios

This table reports the means, standard deviations, minimum values, maximum values, and the number of observations of the definitions for risk-free portfolios. Numbers without brackets are the values for all the individuals in the BHPS. Numbers within brackets are for the head of the household only.

	All Individuals (Head of Household)									
	Mean		Sdv		Min		Max		N	
Risk-free portfolios										
Savings (SAV)	3535	(4198)	11582	(13101)	0	(0)	228000	(228000)	40457	(21186)
SAV/FW	0.76	(0.72)	0.36	(0.38)	0	(0)	1	(1)	22876	(11927)
SAV/TW	0.14	(0.17)	0.31	(0.33)	0	(0)	1	(1)	33925	(17262)

Table 13 shows that average savings is £3,535 for individuals and £4,198 for the head of the household. Savings takes up 76% of total financial wealth and 14% of total wealth for individuals. For the head of the household, 72% of financial wealth and 17% of total wealth are made up by savings. The level of savings the respondents have ranges from 0 to £228,000.

Table 14 Descriptive statistics of risky portfolios

This table reports the means, standard deviations, minimum values, maximum values, and the number of observations of the definitions for risky portfolios. Numbers without brackets are the values for all the individuals in the BHPS. Numbers within brackets are for the head of the household only.

	All Individuals (Head of Household)									
	Mean		Sdv		Min		Max		N	
Risky portfolios										
Investment (INV)	3084	(4043)	15664	(18427)	0	(0)	345000	(345000)	40457	(21185)
INV/FW	0.24	(0.28)	0.36	(0.38)	0	(0)	1	(1)	22876	(11927)
INV/TW	0.04	(0.05)	0.15	(0.16)	0	(0)	1	(1)	33925	(17262)

In Table 14, the average investment for individuals is £3,084 and £4,043 for the head of the household. Investment constitutes 24% of total financial wealth and 4% of total wealth for individuals. As for the head of the household, investment makes up 28% of financial wealth and 5% of total wealth. The standard deviation for individual investment is 15664, which indicates the amount of investment varies largely among individuals. The amount of investment

individuals in the BHPS have ranges from 0 to £345,000.

Table 15 Descriptive statistics of debt choices

This table reports the means, standard deviations, minimum values, maximum values, and the number of observations of the definitions for debt choices. Numbers without brackets are the values for all the individuals in the BHPS. Numbers within brackets are for the head of the household only.

	All Individuals (Head of Household)									
	Mean		Sdv		Min		Max		N	
Debt										
Personal Debt (PD)	1289	(1432)	3747.5	(4125)	0	(0)	72000	(70000)	40455	(21184)
PD/TD	0.31	(0.35)	0.44	(0.45)	0	(0)	1	(1)	22811	(11237)
MG/TW	0.44	(0.45)	0.26	(0.26)	0	(0)	1	(1)	15702	(7375)

Average amount of unsecured debt of all individuals is £1,289 and the head of the household borrows even more at £1,432. Unsecured debt comprises 31% of total debt borrowing for individuals and 35% for household heads. Mortgage makes up 44% of an individual's total wealth. Due to my definition of total wealth which consists of savings, investment, and the value of one's home, it is expected that the ratio of mortgage to total wealth should not exceed 1.

4.4.4. Methodology

This section introduces the methodology that is used in analysis in this chapter. It starts with introducing a general statistic model for estimating the predictability of the BHPS variables and optimism, followed by detailed regression equations that will be analyzed in section 4.5.

4.4.4.1. General Model

I have discussed the published literature in Chapter 2 which demonstrated that optimism affects people's decision making. Individuals, including corporate managers and financial

professionals, consistently overestimate the probability of positive outcomes and therefore decide on risky business strategies or choose risky investment opportunities. In this chapter, I aim at unveiling the effect of financial optimism on normal individuals' portfolio choice. I also discussed in section 4.2.2 that the relationship between demographics and household portfolio choice is relatively well researched and these demographics are demonstrated to have effect on portfolio choice. Therefore I believe that financial optimism and demographics jointly influence individual and household portfolio choice. The general model for financial optimism and portfolio choice can be expressed as follows.

$$Portfolio\ Choice_{p,t} = f\left(Optimism_{p,t}\right) + f(Demographics_{p,t}) \qquad \text{Equation 3}$$

Where $Portfolio\ Choice_{p,t}$ represents the portfolio choices of an individual investor p in year t, $f\left(Optimism_{p,t}\right)$ stands for the function of financial optimism of that individual p in year t, $f(Demographics_{p,t})$ denotes the function of demographic variables of the individual p in year t.

In my regression equations I had the choice of treating variables at linear contributing factors, or non-linear factors. I assume the functions of optimism and demographics have linear relationships which is a basic approach used in many studies on demographics and household portfolio choice discussed in section 4.2.2. However, the logarithm to the base 10 is applied to financial variables, such as income, to reflect the potential non-linear contribution of these variables to portfolio choice (Cocco, Gomes, & Maenhout, 2005; Brown et al, 2005). I use ordinary least squares (OLS) approach to estimate the effect of financial optimism and demographics. This method minimizes the sum of squared vertical distances between the actual observations from the data set and the predicted model values. The resulting estimator in a sample can be expressed by the following formula.

$$y_i = x_i\beta + \epsilon_i$$ Equation 4

Where $\beta = (\beta_0, \beta_1, \ldots, \beta_i)$ is a vector of $i + 1$ parameters, which explain the relationships between dependent variable y_i and independent variable $x_i = (1, x_1, x_2, \ldots, x_i)$. ϵ_i is the error term.

4.4.4.2. Regression Models

In this section, I apply the definitions of financial optimism (discussed in section 3.3.1), demographic variables (see section 4.2.3), and definitions of portfolio choices (see details in section 4.4.2) to the general linear model in the above section. The following regression models are developed by using portfolio choices as the dependent variables with financial optimism and demographics as independent variables to estimate the contributions of these explanatory variables.

Regression analysis with interaction between independent variables will result in extremely large regression equations with potentially highly correlated terms which cannot be reduced even using variable secretion models because of co-linearity. Therefore coefficients for the interaction of variables are not calculated in my regression equations. Section 3.4.4 shows that some of the BHPS variables are correlated, therefore variable selection methods such as stepwise regression methods might not be suitable as it does not know which contributing variable to eliminate in the multiple regression steps. Additionally, as all the demographic variables I use in the regression correlate with portfolio choices in the existing literature, I decided not to remove any of them in my analysis to obtain initial observations.

The regression equations are run using data from all individuals with valid responses in the BHPS. Then I check the robustness of my findings by conducting these regressions only on the

head of the household. I also analyse the data in wave 1995, 2000, and 2005 respectively to remove potentially unobserved heterogeneity in the time series (the results are reported in Appendix 5).

Risk-free Portfolios:

$$Ln\,(SAV_i) = \beta_0(optimism_i) + \sum_{j=1}^{19} \beta_j\, Demographics_{i,j} + \epsilon_i \qquad \text{Equation 5}$$

$$SAV_i/FW_i = \beta_0(optimism_i) + \sum_{j=1}^{19} \beta_j\, Demographics_{i,j} + \epsilon_i \qquad \text{Equation 6}$$

$$SAV_i/TW_i = \beta_0(optimism_i) + \sum_{j=1}^{19} \beta_j\, Demographics_{i,j} + \epsilon_i \qquad \text{Equation 7}$$

Risky Portfolios:

$$Ln\,(INV_i) = \beta_0(optimism_i) + \sum_{j=1}^{19} \beta_j\, Demographics_{i,j} + \epsilon_i \qquad \text{Equation 8}$$

$$INV_i/FW_i = \beta_0(optimism_i) + \sum_{j=1}^{19} \beta_j\, Demographics_{i,j} + \epsilon_i \qquad \text{Equation 9}$$

$$INV_i/TW_i = \beta_0(optimism_i) + \sum_{j=1}^{19} \beta_j\, Demographics_{i,j} + \epsilon_i \qquad \text{Equation 10}$$

Debt Choices:

$$Ln\,(PD_i) = \beta_0(optimism_i) + \sum_{j=1}^{19} \beta_j\, Demographics_{i,j} + \epsilon_i \qquad \text{Equation 11}$$

$$PD_i/TD_i = \beta_0(optimism_i) + \sum_{j=1}^{19} \beta_j\, Demographics_{i,j} + \epsilon_i \qquad \text{Equation 12}$$

$$MG_i/TW_i = \beta_0(optimism_i) + \sum_{j=1}^{19} \beta_j\, Demographics_{i,j} + \epsilon_i \qquad \text{Equation 13}$$

In the above equations, *i* represents each observation in the panel.

The demographic variables include[1]:

[1] Because certain independent demographic variables are components of the dependent variables in the same regression equation, I made adjustments for these regression analysis and remove these demographic variables from independent variable list. For example, in Equation 13, mortgage is an independent variable ($Demographics_{13}$) and at the same time a significant component to the dependent variable (MG_i/TW_i - the ratio of mortgage to total wealth). I therefore remove mortgage from independent variable list for this regression.

$Demographics_1$	Age
$Demographics_2$	Male
$Demographics_3$	Married
$Demographics_4$	White
$Demographics_5$	Healthy
$Demographics_6$	Household size
$Demographics_7$	Financial wealth
$Demographics_8$	Annual income
$Demographics_9$	Annual household income
$Demographics_{10}$	Home ownership
$Demographics_{11}$	Home purchase price
$Demographics_{12}$	Current home value
$Demographics_{13}$	Mortgage outstanding
$Demographics_{14}$	Business ownership
$Demographics_{15}$	Occupation
$Demographics_{16}$	Permanent contract
$Demographics_{17}$	Unemployed
$Demographics_{18}$	Unemployed a year ago
$Demographics_{19}$	Education

4.5. Analysis and Findings

In the following sections, I summarise the profile of optimists and compare the profile of optimists with that of pessimists and neutral respondents. Then I carry out OLS regression analysis to estimate the effect of financial optimism on individual portfolio choice for all individual investors in the BHPS. Definitions of risk-free portfolios, risky portfolios, and debt choices that have been discussed in Section 4.4.2 are used as dependent variables. I conclude by running the regression analysis on the head of the household instead of on all individuals to check the robustness of the effects of financial optimism. Data in waves 1995, 2000 and 2005 are analysed respectively to eliminate potential heterogeneity in time series and the results are reported in Appendix 5.

4.5.1. Characteristics of Optimists, Pessimists and Neutral Respondents

In Section 4.5.1 comparisons are carried out to distinguish the difference in characteristics among optimists, pessimists and neutral respondents. Student's *t*-test (Welch's *t*-test: unequal sample sizes and unequal variance) is used to examine the significance of these differences.

4.5.1.1. Profile of Optimists

I first selected people who are financially optimistic with the measures of *Financial expectation*, *A priori optimism*, or *A posteriori optimism*. Then I display the average values for the portfolio choices and demographics of the optimists in Table 16 in order to observe the profile of optimistic investors.

Table 16 Profile of Optimists

This table reports the average values for portfolio choices and demographics for optimists for all three measures of financial optimism. The left column displays the variables for portfolio choices and demographics. The remaining three columns report the mean for these variables for optimists measured by *Financial expectation*, *A priori optimism*, and *A posteriori optimism* respectively.

	Profile of Optimists		
	Financial Expectation	**A Priori Optimism**	**A Posteriori Optimism**
Risk-free portfolios			
Savings (SAV)	2358	2766	3011
SAV/FW	0.77	0.74	0.75
SAV/TW	0.15	0.14	0.14
Risky portfolios			
Investment (INV)	2334	2716	3026
INV/FW	0.23	0.26	0.25
INV/TW	0.04	0.05	0.04
Debt			
Personal Debt (PD)	2185	1824	1660
PD/TD	0.34	0.35	0.33
MG/TW	0.49	0.46	0.46
Personal Characteristics			
Age	34.41	40.63	41.30
Male	0.52	0.47	0.47
Married	0.60	0.64	0.66
White	0.95	0.96	0.96
Healthy	0.93	0.90	0.90
Household size	3.14	3.00	3.00
Wealth and Income			
Total financial wealth	4994	5618	6282
Total wealth	96224	95492	101128
Annual income	12555	11531	11918
Annual household income	29640	25984	26579
Home ownership	0.70	0.69	0.71
Home purchase price	38162	36542	35780
Current home value	123009	122634	116434
Mortgage outstanding	42110	34790	33093
Employment Profile			
Business ownership	0.13	0.11	0.12
Finance related occupation	0.07	0.05	0.05
Employment: permanent contract	0.67	0.54	0.60
Unemployed	0.07	0.08	0.05
Unemployed a year ago	0.05	0.05	0.04
Education: first degree or above	0.40	0.36	0.35

As shown in Table 16, for *Financial expectation*, *A priori optimism*, and *A posteriori optimism* respectively, the average savings for optimists is £2,358, £2,766 and £3,011, the average investment is £2,334, £2,716 and £3,026, and the average unsecured debt they borrow is £2,185, £1,824 and £1,660. Under the *A priori optimism* measure, an average optimist is 40.63 years old

with 3 people being in her household. Her total wealth is £95,492 with annual income of £11,531 and annual household income of £25,984. The value of the property she owns is £122,634 and she still has a mortgage of £34,790. As for the employment profile of the optimists, 11% of them have business ownership, 54% have permanent contracts, and 36% have first degree or above, while 8% are unemployed.

After looking at the general profile of optimists in the above table, I examine the difference between the profile of optimists, pessimists and neutral respondents using the three measures of financial optimism in the next section.

4.5.1.2. Comparison between Optimist, Pessimists and Neutral Respondents

In the following tables, individuals in the BHPS are divided to optimistic, neutral, and pessimistic respondents according to their optimism scores (see details in section 3.3.2). The purpose of this section is to analyse whether there are significant differences in respondents' portfolio choices and demographic characteristics among those who are financial optimistic, neutral, or pessimistic.

Table 17 Financial expectation: comparisons between optimists, neutral respondents, and pessimists

This table reports the comparisons on portfolio choice and demographics between optimists, neutral respondents, and pessimists based on *Financial expectation* measure. The left column displays the variables for measures of financial optimism, portfolio choices and demographics. The remaining three columns report the mean of these variables for optimists, neutral respondents, and pessimists respectively. 'a' denotes the significant difference between optimists and pessimists in terms of the means of variables listed in the left column, 'b' denotes the significant difference between optimists and neutral respondents, and 'c' the denotes the significant difference between neutral respondents and pessimists. 5% is the level of significance unless denoted by * which means the result is significant at a 10% level of significance.

	Financial Expectation		
	Optimistic	**Neutral**	**Pessimistic**
Heuristics of optimism			
Financial expectation	2	1	0
A priori optimism	0.82	-0.04	-0.68
A posteriori optimism	0.72	0.00	-0.64
Risk-free portfolios			
Savings (SAV)	2358 a	3832 b	4923 c
SAV/FW	0.77 a	0.75 b	0.74 c*
SAV/TW	0.15 a*	0.14 b	0.14
Risky portfolios			
Investment (INV)	2334 a	3301 b	3778 c
INV/FW	0.23 a	0.25 b	0.26 c*
INV/TW	0.04 a	0.04	0.05 c
Debt			
Personal Debt (PD)	2185 a	927 b	1181 c
PD/TD	0.34	0.29 b	0.33 c
MG/TW	0.49 a	0.41 b	0.39 c
Personal Characteristics			
Age	34.41 a	48.95 b	48.80
Male	0.52 a	0.44 b	0.47 c
Married	0.60 a	0.66 b	0.64 c
White	0.95 a	0.95	0.97 c
Healthy	0.93 a	0.90 b	0.88 c
Household size	3.14 a	2.78 b	2.68 c
Wealth and Income			
Total financial wealth	4994 a	7626 b	9495 c
Total wealth	96224 a	104468 b	114013 c
Annual income	12555 a	11082 b	11472 c
Annual household income	29640 a	25154 b	25202
Home ownership	0.70 a	0.71 b	0.73 c
Home purchase price	38162 a	32546 b	33719 c
Current home value	123009 a	127045 b	125437 c*
Mortgage outstanding	42110 a	24720 b	25044
Employment Profile			
Business ownership	0.13 a	0.09 b	0.08 c
Finance related occupation	0.07 a	0.04 b	0.04
Employment: permanent contract	0.67 a	0.47 b	0.45 c
Unemployed	0.07 a	0.03 b	0.03
Unemployed a year ago	0.05 a	0.03 b	0.03
Education: first degree or above	0.40 a	0.28 b	0.31 c

The results in the above table show that people who have optimistic *Financial expectation* are significantly younger, more likely to be male, have higher educational qualifications, are more likely to have business ownership, borrow more personal debt and take on higher mortgage than people with neutral or pessimistic *Financial expectation*. Interestingly optimistic respondents have less savings (£2,358 for optimists vs. £4,923 for pessimists) and investment (£2,334 for optimists vs. £3,778 for pessimists) but higher unsecured debt (£2,185 for optimists vs. £1,181 for pessimists) and higher average unemployment rate (7% for optimists vs. 3% for pessimists) than pessimistic respondents. I suggest that the smaller amount of financial wealth of optimists is probably partly due to the fact that optimists (34.41 years old) in the sample are much younger than pessimists (48.80 years old) and therefore optimists have accumulated lower wealth on average. As for the higher unemployment rate among optimistic respondents, this might reflect the irrational aspect of being optimistic. It is understandable that people who are unemployed and have very little income may perceive themselves as already at the depths of their financial situation, do not think or are not willing to think their finances are going to be even worse for the next year and aspire and hope for a better future. Optimists have significantly higher annual individual and household income compared to non-optimistic investors. Optimists also have significantly higher business ownership than non-optimists. The results in Table 17 are almost all significant amongst my comparisons which indicate people with different financial expectation have very different demographic and wealth-related characteristics.

Table 18 A priori optimism: comparisons between optimists, neutral respondents, and pessimists

This table reports the comparisons on portfolio choices and demographics between optimists, neutral respondents, and pessimists based on *A priori optimism* measure. The left column displays the variables for measures of financial optimism, portfolio choices and demographics. The remaining three columns report the mean of these variables for optimists, neutral respondents, and pessimists respectively. 'd' denotes the significant difference between optimists and pessimists in terms of the means of variables listed in the left column, 'e' denotes the significant difference between optimists and neutral respondents, and 'f' denotes a significant difference between neutral respondents and pessimists. 5% is the level of significance unless denoted by * which means the result is significant at a 10% level of significance.

	A Priori Optimism		
	Optimistic	**Neutral**	**Pessimistic**
Heuristics of optimism			
Financial expectation	1.59	1.11	0.72
A priori optimism	1.28	0.00	-1.09
A posteriori optimism	0.59	0.07	-0.38
Risk-free portfolios			
Savings (SAV)	2766 d	3637 e	4304 f
SAV/FW	0.74 d	0.76 e	0.78 f
SAV/TW	0.14 d	0.14	0.16 f
Risky portfolios			
Investment (INV)	2716 d	3159 e	3370
INV/FW	0.26 d	0.24 e	0.22 f
INV/TW	0.05 d	0.04 e	0.04 f*
Debt			
Personal Debt (PD)	1824 d	1064 e	1249 f
PD/TD	0.35 d	0.29 e	0.29
MG/TW	0.46 d	0.42 e	0.43 f
Personal Characteristics			
Age	40.63 d	48.08 e	42.02 f
Male	0.47 d	0.47	0.45 f
Married	0.64 d	0.64	0.63 f
White	0.96 d	0.94 e	0.97 f
Healthy	0.90 d	0.90	0.92 f
Household size	3.00 d	2.79 e	2.93 f
Wealth and Income			
Total financial wealth	5618 d	7343 e	8365 f
Total wealth	95492 d	105498 e	106369
Annual income	11531 d	10986 e	13127 f
Annual household income	25984 d	25389 e	29775 f
Home ownership	0.69 d	0.71 e	0.74 f
Home purchase price	36541	32340 e	36332 f
Current home value	122633 d	127259 e	125674 f
Mortgage outstanding	34790 d	25588 e	33113 f
Employment Profile			
Business ownership	0.11 d	0.09 e	0.10 f
Finance related occupation	0.05 d	0.04 e	0.06 f
Employment: permanent contract	0.54 d	0.48 e	0.64 f
Unemployed	0.08 d	0.03 e	0.02 f
Unemployed a year ago	0.05 d	0.03 e	0.03
Education: first degree or above	0.36 d	0.28 e	0.37 f

As shown in Table 18, when *A priori optimism* is used to distinguish optimists, pessimists and neutral respondents, optimists have less savings (£2,766 for optimists vs. £4,304 for pessimists) and investment (£2,716 for optimists vs. £3,360 for pessimists) but higher unsecured debt (£1,824 for optimists vs. £1,249 for pessimists). Optimists (40.63 years old) in the sample are on average younger than pessimists (42.02 years old). 47% of optimists are married compared to 45% of pessimists who are married. Fewer optimists (69%) than pessimists (74%) have homeownership. Optimists (£34,790) take on more mortgage than pessimists (£33,113). Optimists (8%) have a higher average unemployment rate than pessimists (2%).

When using *A posteriori optimism* to distinguish among optimists, pessimists and neutral respondents in Table 19, optimists have less savings (£3,011 for optimists vs. £4,059 for pessimists) and investments (£3,026 for optimists vs. £3,296 for neutral respondents) but higher unsecured debt (£1,659 for optimists vs. £1,261 for pessimists). Optimists (41.3 years old) in the sample are on average younger than pessimists (43.4 years old). 66% of optimists are married compared to 64% of pessimists who are married. Fewer optimists (71%) than pessimists (73%) have homeownership. Optimists (£33,093) take on more mortgage than pessimists (£31,127). Optimists (5%) have higher average unemployment rate than pessimists (3%).

Evidence in Table 17 to Table 19 suggests that optimists are not financially better off than pessimists. It is statistically significant that optimists have lower savings and investment but a larger amount of debt and mortgage and a higher unemployment rate compare to pessimists and neutral respondents.

Table 19 A posteriori optimism: comparisons between optimists, neutral respondents, and pessimists

This table reports the comparisons on portfolio choices and demographics between optimists, neutral respondents, and pessimists based on *A posteriori optimism* measure. The left column displays the variables for measures of financial optimism, portfolio choices and demographics. The remaining three columns report the mean of these variables for optimists, neutral respondents, and pessimists respectively. 'g' denotes the significant difference between optimists and pessimists in terms of the means of variables listed in the left column, 'h' denotes the significant difference between optimists and neutral respondents, and 'i' denotes a significant difference between neutral respondents and pessimists. 5% is the level of significance unless denoted by * which means the result is significant at a 10% level of significance.

	A Posteriori Optimism		
	Optimistic	**Neutral**	**Pessimistic**
Heuristics of optimism			
Financial expectation	1.54	1.12	0.71
A priori optimism	0.59	0.07	-0.43
A posteriori optimism	1.19	0.00	-1.08
Risk-free portfolios			
Savings (SAV)	3011 g	3859 h	4059
SAV/FW	0.75 g	0.75 h*	0.76
SAV/TW	0.14	0.13 h	0.15 i
Risky portfolios			
Investment (INV)	3026	3296 h*	3277
INV/FW	0.25 g	0.25 h*	0.24
INV/TW	0.04	0.04 h	0.04 i
Debt			
Personal Debt (PD)	1659 g	1143 h	1261 i
PD/TD	0.33 g	0.3 h	0.27 i
MG/TW	0.46 g	0.42 h	0.43
Personal Characteristics			
Age	41.30 g	47.78 h	43.40 i
Male	0.47 g	0.45 h	0.46 i
Married	0.66 g	0.66	0.64 i
White	0.96 g	0.95 h	0.97 i
Healthy	0.90 g	0.91 h	0.91
Household size	3.00 g	2.78 h	2.88 i
Wealth and Income			
Total financial wealth	6282 g	7696 h	7918
Total wealth	101128 g	107113 h	106017
Annual income	11918 g	11250 h	12257 i
Annual household income	26579 g	25509 h	27480 i
Home ownership	0.71 g	0.73 h	0.73
Home purchase price	35780	32493 h	35622 i
Current home value	116433 g	119740 h	117769 i
Mortgage outstanding	33093 g	25515 h	31127 i
Employment Profile			
Business ownership	0.12 g	0.10 h	0.10
Finance related occupation	0.05	0.04 h	0.05 i
Employment: permanent contract	0.60 g	0.50 h	0.58 i
Unemployed	0.05 g	0.03 h	0.03
Unemployed a year ago	0.04 g	0.03 h	0.03
Education: first degree or above	0.35	0.30 h	0.35 i

4.5.2. Financial Optimism and Portfolio Choice for all Individual Investors

In the following analysis, I examine the relationship between financial optimism and investment in risk-free portfolios, risky portfolios, and debt choices for all individual investors in this section. Risk-free portfolios, risky portfolios, and debt choices are defined in section 4.4.2. I test the effect of financial optimism on portfolio choices using *Financial expectation*, *A priori optimism*, and *A posteriori optimism* respectively. The results are reported in the following sections.

4.5.2.1. Financial Optimism and Risk-free Portfolios for Individual Investors

I test the correlation between financial optimism and investors' choices on risk-free portfolios in this section. Table 21 to Table 22 provides estimated coefficients for financial optimism and demographic variables. Total amount of savings, ratio of savings to financial wealth and ratio of savings to total wealth are used as definitions of risk-free portfolios (see details in 4.4.2).

Table 20 Financial optimism and the amount of risk-free assets for all individual investors

This table reports the regression results for Equation 5. Variables listed in the left column including financial optimism and demographics are independent variables for the regression. The level of savings (Ln(SAV)) in the first row is the dependent variable in the regression equation. Beta coefficients and the *p*-values associated with each coefficient are reported in the rest of the columns. *Financial expectation*, *A priori optimism*, and *A posteriori optimism* are used as measures of Financial optimism with coefficients and *p*-values reported respectively under each measure.

	Risk-free Portfolios: Ln (SAV)					
	Financial Expectation		**A Priori Optimism**		**A Posteriori Optimism**	
	Beta	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**
Financial Optimism	-0.037	0.000	-0.072	0.000	-0.036	0.000
Age	0.069	0.000	0.072	0.000	0.079	0.000
Male	-0.018	0.000	-0.018	0.000	-0.018	0.000
Married	-0.002	0.634	-0.001	0.919	0.006	0.235
White	0.030	0.000	0.029	0.000	0.028	0.000
Healthy	0.078	0.000	0.075	0.000	0.075	0.000
Household size	-0.101	0.000	-0.101	0.000	-0.113	0.000
Annual income (ln)	0.129	0.000	0.132	0.000	0.110	0.000
Annual household income (ln)	0.098	0.000	0.096	0.000	0.103	0.000
Home ownership	-0.054	0.010	-0.054	0.010	-0.063	0.004
Home purchase price (ln)	0.046	0.000	0.049	0.000	0.047	0.000
Current home value (ln)	0.184	0.000	0.182	0.000	0.199	0.000
Mortgage outstanding (ln)	-0.017	0.004	-0.017	0.005	-0.020	0.002
Business ownership	0.010	0.031	0.010	0.026	0.010	0.033
Finance related occupation	0.035	0.000	0.033	0.000	0.033	0.000
Employment: permanent contract	-0.018	0.005	-0.024	0.000	-0.017	0.009
Unemployed	-0.034	0.000	-0.025	0.000	-0.029	0.000
Unemployed a year ago	-0.023	0.000	-0.027	0.000	-0.024	0.000
Education: first degree or above	0.092	0.000	0.091	0.000	0.090	0.000
R Square	0.146		0.150		0.143	

Table 20 displays the results for the correlation between financial optimism and amount of savings an investor has. All three measures of optimism have a significant negative correlation with investment in risk-free portfolios at 5% significance level with coefficients of -0.037, -0.072 and -0.036 respectively. These results mean that optimists have a smaller amount of savings compared to non-optimistic investors. As investors age, they own higher levels of risk-free assets. This result is consistent with previous literature that there is a positive relationship between age and ownership of safe assets (Morin and Suarez, 1983; Bakshi and Chen, 1994; Cocco et. al., 2005). Being white, healthy, having higher income, more expensive homes, business ownership, working in finance related fields or being highly educated increases the level of savings. On the other hand, being male, having bigger households, having home ownership, a larger mortgage, a permanent contract or being unemployed leads to lower levels

of savings.

Table 21 Financial optimism and the ratio of risk-free assets to financial wealth for all individual investors

This table reports the regression results for Equation 6. Variables listed in the left column including financial optimism and demographics are independent variables for the regression. The ratio of risk-free assets to financial wealth (SAV/FW) in the first row is the dependent variable in the regression equation. Beta coefficients and the *p*-values associated with each coefficient are reported in the rest of the columns. *Financial expectation*, *A priori optimism*, and *A posteriori optimism* are used as measures of Financial optimism with coefficients and *p*-values reported respectively under each measure.

	Risk-free Portfolios: SAV/FW					
	Financial Expectation		**A Priori Optimism**		**A Posteriori Optimism**	
	Beta	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**
Financial Optimism	0.000	0.955	-0.043	0.000	-0.015	0.022
Age	-0.094	0.000	-0.096	0.000	-0.095	0.000
Male	-0.063	0.000	-0.063	0.000	-0.064	0.000
Married	-0.038	0.000	-0.036	0.000	-0.034	0.000
White	-0.001	0.885	-0.001	0.825	-0.001	0.823
Healthy	-0.015	0.025	-0.016	0.017	-0.014	0.034
Household size	0.009	0.254	0.010	0.213	0.011	0.171
Annual income (ln)	-0.039	0.000	-0.038	0.000	-0.040	0.000
Annual household income (ln)	-0.011	0.194	-0.014	0.091	-0.013	0.127
Home ownership	0.119	0.000	0.119	0.000	0.126	0.000
Home purchase price (ln)	-0.079	0.000	-0.078	0.000	-0.078	0.000
Current home value (ln)	-0.176	0.000	-0.177	0.000	-0.187	0.000
Mortgage outstanding (ln)	0.030	0.000	0.031	0.000	0.031	0.000
Business ownership	-0.014	0.036	-0.013	0.048	-0.014	0.037
Finance related occupation	-0.056	0.000	-0.056	0.000	-0.057	0.000
Employment: permanent contract	0.016	0.066	0.014	0.100	0.017	0.068
Unemployed	0.000	0.994	0.006	0.430	-0.001	0.940
Unemployed a year ago	0.004	0.539	0.002	0.751	0.003	0.666
Education: first degree or above	-0.062	0.000	-0.062	0.000	-0.061	0.000
R Square	0.056		0.058		0.056	

Table 21 presents the results for the relationship between financial optimism and the ratio of risk-free assets to financial wealth for all individual investors. The estimated results show that financial optimism is negatively correlated with risk-free portfolio choices. When investors are optimistic, they have lower percentage of investment in savings among their financial wealth. I conducted the estimation using all three measures of optimism. The coefficients for *A priori optimism* and *A posteriori optimism* are -0.043 and -0.020 respectively and they are both significant at 95% confidence level. Among variables of personal characteristics, age is significantly negatively correlated with the ratio of savings to financial wealth. Being male has

a negative impact on investment in risk-free portfolios. The effect of gender is consistent with most of the existing literature (Bajtelsmit & VanDerhei, 1997; Hinz, McCarthy, & Turner, 1997). Investors who are married have a lower proportion of risk-free assets in their financial wealth, whick is consistent with some of the previous literature such as Bertocchi, Brunetti, & Torricelli (2009). One's annual income is significantly negatively correlated with investment in risk-free portfolios. Home ownership has a positive effect on holding risk-free assets. Higher the home purchase price and current home value of one's property, the less the proportion of savings one would have. Having a finance related job or business ownership would reduce the investment in risk-free portfolios. People with higher degrees are less likely to prefer to invest in risk-free portfolios.

Table 22 Financial optimism and the ratio of risk-free assets to total wealth for all individual investors

This table reports the regression results for Equation 7. Variables listed in the left column including financial optimism and demographics are independent variables for the regression. The ratio of risk-free assets to total wealth (SAV/TW) in the first row is the dependent variable in the regression equation. Beta coefficients and the *p*-values associated with each coefficient are reported in the rest of the columns. *Financial expectation*, *A priori optimism*, and *A posteriori optimism* are used as measures of Financial optimism with coefficients and *p*-values reported respectively under each measure.

	Risk-free Portfolios: SAV/TW					
	Financial Expectation		**A Priori Optimism**		**A Posteriori Optimism**	
	Beta	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**
Financial Optimism	0.005	0.123	-0.010	0.002	-0.002	0.546
Age	-0.002	0.667	-0.003	0.466	-0.004	0.410
Male	-0.011	0.001	-0.011	0.001	-0.011	0.001
Married	0.002	0.674	0.002	0.631	0.003	0.421
White	0.011	0.000	0.011	0.000	0.014	0.000
Healthy	-0.007	0.029	-0.007	0.026	-0.007	0.047
Household size	0.000	0.961	0.000	0.955	-0.001	0.764
Total financial wealth (ln)	0.072	0.000	0.071	0.000	0.074	0.000
Annual income (ln)	0.013	0.002	0.013	0.001	0.016	0.000
Annual household income (ln)	-0.016	0.000	-0.016	0.000	-0.016	0.000
Home ownership	-0.843	0.000	-0.843	0.000	-0.842	0.000
Home purchase price (ln)	-0.045	0.000	-0.045	0.000	-0.047	0.000
Mortgage outstanding (ln)	-0.034	0.000	-0.034	0.000	-0.035	0.000
Business ownership	-0.004	0.175	-0.004	0.216	-0.006	0.072
Finance related occupation	-0.007	0.035	-0.007	0.038	-0.007	0.033
Employment: permanent contract	-0.009	0.041	-0.009	0.036	-0.009	0.045
Unemployed	0.000	0.899	0.002	0.575	0.004	0.247
Unemployed a year ago	0.001	0.746	0.001	0.857	0.002	0.630
Education: first degree or above	-0.012	0.000	-0.012	0.001	-0.013	0.000
R Square	0.775		0.775		0.775	

Table 22 shows that there is a negative impact of financial optimism on the proportion of risk-free assets among total wealth. Only *A priori optimism* is significantly negatively correlated with investment in risk-free portfolios at 95% confidence level. The coefficient for *A priori optimism* (-0.010) shows that optimistic investors have lower proportion in savings among their total wealth. The result still supports the findings from Table 20 and Table 21 that financial optimism has a negative impact on the allocation wealth to risk-free portfolios.

4.5.2.2. Financial Optimism and Risky Portfolios for Individual Investors

I analyse the relationship between financial optimism and investment in risky portfolios in this section. Table 24 to Table 25 provide estimated coefficients for optimism and demographic variables. Total amount of investment, percentage of investment among financial wealth, and percentage of investment among total wealth are used as definitions of risky portfolios (see details in 4.4.2)[1].

[1] In theory, as discussed under section 4.4.2, housing is traditionally treated as a riskless asset but under the current economic climate it could be either type of asset depending on investors' planning horizon. As I do not have information on each individual's planning horizon, there is not enough reason to treat housing as either a risky or riskless asset. In practice, I tried to treat home value as a risky asset in alternative regression analysis but the results were mixed (Financial expectation shows a negative correlation with housing, A priori optimism shows a positive correlation, while A posteriori shows no significant correlation. See details in Appendix 6). My concern is that regression using housing as the dependent variable might have little value because home value is a very large component in total wealth, and is on average about 20 times financial wealth. If I treat home value as a risky asset then it has to be a numerator to be consistent with the other portfolio definitions, however this value then completely dominates other values in the asset definition. Due to both technical and theoretical reasons, the analysis would be more accurate if housing serves as a component of the total wealth (denominator).

Table 23 Financial optimism and the amount of risky assets for all individual investors

This table reports the regression results for Equation 8. Variables listed in the left column including financial optimism and demographics are independent variables for the regression. The amount of investment (Ln(INV)) in the first row is the dependent variable in the regression equation. Beta coefficients and the *p*-values associated with each coefficient are reported in the rest of the columns. *Financial expectation*, *A priori optimism*, and *A posteriori optimism* are used as measures of Financial optimism with coefficients and *p*-values reported respectively under each measure.

	Risky Portfolios: Ln (INV)					
	Financial Expectation		**A Priori Optimism**		**A Posteriori Optimism**	
	Beta	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**
Financial Optimism	-0.026	0.000	-0.015	0.001	-0.008	0.085
Age	0.094	0.000	0.099	0.000	0.103	0.000
Male	0.038	0.000	0.038	0.000	0.039	0.000
Married	0.033	0.000	0.033	0.000	0.035	0.000
White	0.013	0.008	0.012	0.009	0.014	0.004
Healthy	0.057	0.000	0.057	0.000	0.055	0.000
Household size	-0.065	0.000	-0.065	0.000	-0.071	0.000
Annual income (ln)	0.098	0.000	0.098	0.000	0.087	0.000
Annual household income (ln)	0.053	0.000	0.053	0.000	0.061	0.000
Home ownership	-0.139	0.000	-0.139	0.000	-0.160	0.000
Home purchase price (ln)	0.091	0.000	0.091	0.000	0.090	0.000
Current home value (ln)	0.265	0.000	0.265	0.000	0.290	0.000
Mortgage outstanding (ln)	-0.055	0.000	-0.055	0.000	-0.058	0.000
Business ownership	0.019	0.000	0.018	0.000	0.019	0.000
Finance related occupation	0.071	0.000	0.070	0.000	0.071	0.000
Employment: permanent contract	-0.041	0.000	-0.043	0.000	-0.042	0.000
Unemployed	-0.013	0.022	-0.012	0.029	-0.010	0.073
Unemployed a year ago	-0.011	0.040	-0.012	0.028	-0.011	0.039
Education: first degree or above	0.120	0.000	0.119	0.000	0.118	0.000
R Square	0.139		0.138		0.139	

I found in Table 23 that financial optimism is negatively correlated with the amount of investment individuals have. This finding supports what I found in section 3.4.4 that optimists have less investment as well as savings. All three measures of financial optimism have significant positive correlations with investment in risky portfolios at a 5% significance level with coefficients of -0.026, -0.015 and 0.008 respectively. Age, being male, and being married all have a positive impact on investing in risky portfolios. Annual individual as well as household income are also significantly positively correlated with investments. Home ownership has a negative impact on investment in risky portfolios, which is consistent with the existing literature (Yao and Zhang, 2005; Shum and Faig, 2006). Higher the home purchase price, the more likely an investor will have a higher amount of investment. People who work in finance, have their own businesses, or have higher educational degrees prefer to invest in risky

assets. Unemployment reduces the chances of having investment.

Table 24 Financial optimism and the ratio of risky assets to financial wealth for all individual investors

This table reports the regression results for Equation 9. Variables listed in the left column including financial optimism and demographics are independent variables for the regression. The ratio of investment to financial wealth (INV/FW) in the first row is the dependent variable in the regression equation. Beta coefficients and the *p*-values associated with each coefficient are reported in the rest of the columns. *Financial expectation*, *A priori optimism*, and *A posteriori optimism* are used as measures of Financial optimism with coefficients and *p*-values reported respectively under each measure.

	Risky Portfolios: INV/FW					
	Financial Expectation		**A Priori Optimism**		**A Posteriori Optimism**	
	Beta	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**
Financial Optimism	0.000	0.955	0.043	0.000	0.015	0.022
Age	0.094	0.000	0.096	0.000	0.095	0.000
Male	0.063	0.000	0.063	0.000	0.064	0.000
Married	0.038	0.000	0.036	0.000	0.034	0.000
White	0.001	0.885	0.001	0.825	0.001	0.823
Healthy	0.015	0.025	0.016	0.017	0.014	0.034
Household size	-0.009	0.254	-0.010	0.213	-0.011	0.171
Annual income (ln)	0.039	0.000	0.038	0.000	0.040	0.000
Annual household income (ln)	0.011	0.194	0.014	0.091	0.013	0.127
Home ownership	-0.119	0.000	-0.119	0.000	-0.126	0.000
Home purchase price (ln)	0.079	0.000	0.078	0.000	0.078	0.000
Current home value (ln)	0.176	0.000	0.177	0.000	0.187	0.000
Mortgage outstanding (ln)	-0.030	0.000	-0.031	0.000	-0.031	0.000
Business ownership	0.014	0.036	0.013	0.048	0.014	0.037
Finance related occupation	0.056	0.000	0.056	0.000	0.057	0.000
Employment: permanent contract	-0.016	0.066	-0.014	0.100	-0.017	0.068
Unemployed	0.000	0.994	-0.006	0.430	0.001	0.940
Unemployed a year ago	-0.004	0.539	-0.002	0.751	-0.003	0.666
Education: first degree or above	0.062	0.000	0.062	0.000	0.061	0.000
R Square	0.056		0.058		0.056	

Table 24 displays the estimated results of the relationship between financial optimism and the proportion of risky investment among one's financial wealth. I find that financial optimism is positively correlated with risky portfolio choices. The estimated coefficients prove that optimistic investors are more likely to have a higher proportion in investments among their total financial wealth. The coefficients for *A priori optimism* and *A posteriori optimism* are 0.043 and 0.015 respectively and they are both significant at 95% confidence level. The logic for optimists to take on more risks in their portfolios is perhaps as implied by Tennen and Affleck (1987). If a person is optimistic about the future, then there is little tendency to worry about the

potentially negative consequences of a risky decision. When comparing the results in Table 24 to that of Table 21, it is clear that the strength of the correlations between financial optimism and portfolio choices is equal but of exactly the opposite directions. These effects are expected due to how I defined portfolio choices. Financial wealth equals the sum of savings and investment, therefore the sum of the dependent variables, INF/FW in Table 24 and SAV/FW in Table 21, equals 1. Other definitions of portfolios are also used in my analysis to assess the robustness of the estimations as definitions of portfolio choices could affect the interpretation of my results implied in Table 24 and Table 21.

Table 25 Financial optimism and the ratio of risky assets to total wealth for all individual investors

This table reports the regression results for Equation 10. Variables listed in the left column including financial optimism and demographics are independent variables for the regression. The ratio of risky assets to total wealth (INV/TW) in the first row is the dependent variable in the regression equation. Beta coefficients and the *p*-values associated with each coefficient are reported in the rest of the columns. *Financial expectation*, *A priori optimism*, and *A posteriori optimism* are used as measures of Financial optimism with coefficients and *p*-values reported respectively under each measure.

	Risky Portfolios: INV/TW					
	Financial Expectation		**A Priori Optimism**		**A Posteriori Optimism**	
	Beta	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**
Financial Optimism	0.006	0.365	0.032	0.000	0.009	0.145
Age	-0.011	0.222	-0.012	0.200	-0.011	0.228
Male	0.043	0.000	0.043	0.000	0.044	0.000
Married	0.004	0.531	0.003	0.635	0.001	0.939
White	-0.002	0.808	-0.001	0.852	-0.004	0.566
Healthy	0.007	0.243	0.008	0.207	0.006	0.351
Household size	-0.022	0.005	-0.022	0.004	-0.018	0.022
Total financial wealth (ln)	0.184	0.000	0.186	0.000	0.190	0.000
Annual income (ln)	0.013	0.104	0.012	0.138	0.011	0.179
Annual household income (ln)	0.004	0.657	0.006	0.480	0.005	0.569
Home ownership	-0.335	0.000	-0.335	0.000	-0.337	0.000
Home purchase price (ln)	0.030	0.000	0.028	0.001	0.031	0.000
Mortgage outstanding (ln)	-0.043	0.000	-0.043	0.000	-0.044	0.000
Business ownership	0.010	0.109	0.010	0.124	0.012	0.062
Finance related occupation	0.019	0.002	0.019	0.002	0.019	0.003
Employment: permanent contract	-0.026	0.002	-0.025	0.003	-0.027	0.002
Unemployed	0.010	0.155	0.006	0.388	0.007	0.330
Unemployed a year ago	0.007	0.328	0.008	0.221	0.007	0.342
Education: first degree or above	0.034	0.000	0.033	0.000	0.034	0.000
R Square	0.070		0.071		0.071	

Table 25 shows that only *A priori optimism* is significantly positively correlated with choosing

risky portfolios. The coefficient for *A priori optimism* (0.032) tells me that optimistic investors have a higher proportion in investments among their total wealth. The coefficient supports the finding from Table 24 that financial optimism has a positive influence on the allocation of one's fortune to risky portfolios relative to her wealth.

4.5.2.3. Financial Optimism and Debt Choices for Individual Investors

I examine the relationship between financial optimism and debt choices for all individual investors in this section. Debt choices are defined as the amount of total unsecured personal debt, the ratio of unsecured personal debt to total debt, and the ratio of mortgage to total wealth (see details in section 4.4.2). I test the correlation between *Financial expectation*, *A priori optimism*, and *A posteriori optimism* with debt choices respectively. Table 26 to Table 28 provides estimated coefficients for financial optimism and demographic variables.

In Table 26 the estimated coefficients show that financial optimism is positively correlated with the amount of unsecured personal debt one borrows. The coefficients for *Financial expectation*, *A priori optimism* and *A posteriori optimism* are 0.054, 0.063 and 0.033 respectively and they are all highly significant at 95% confidence level. These results suggest optimistic people are more convinced of their ability to become financially better off and repay their debt in the future. Therefore they make more risky financial decisions. When an investor gets older, she is less likely to borrow personal debt. Male or married people borrow higher personal debt. Financial wealth is negatively correlated with unsecured debt borrowing while annual income has a positive correlation with borrowing debt. Home ownership, home purchase price and mortgage outstanding are positively related to taking on more unsecured debt. But home value has a negative influence on borrowing debt. Owning a business, having a permanent contract, and achieving higher educational degree all contribute to a higher amount of unsecured debt. However, if a person was unemployed a year ago, it is unlikely that she takes on unsecured personal debt.

Table 26 Financial optimism and the amount of unsecured personal debt for all individual investors

This table reports the regression results for Equation 11. Variables listed in the left column including financial optimism and demographics are independent variables for the regression. The level of unsecured debt (Ln(PD)) in the first row is the dependent variable in the regression equation. Beta coefficients and the *p*-values associated with each coefficient are reported in the rest of the columns. *Financial expectation*, *A priori optimism*, and *A posteriori optimism* are used as measures of Financial optimism with coefficients and *p*-values reported respectively under each measure.

	Debt: Ln (PD)					
	Financial Expectation		**A Priori Optimism**		**A Posteriori Optimism**	
	Beta	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**
Financial Optimism	0.054	0.000	0.063	0.000	0.033	0.000
Age	-0.198	0.000	-0.208	0.000	-0.199	0.000
Male	0.024	0.000	0.025	0.000	0.027	0.000
Married	0.039	0.000	0.036	0.000	0.043	0.000
White	0.013	0.031	0.013	0.027	0.014	0.029
Healthy	-0.003	0.617	-0.002	0.787	-0.005	0.440
Household size	-0.005	0.536	-0.006	0.423	-0.012	0.122
Total financial wealth (ln)	-0.148	0.000	-0.146	0.000	-0.156	0.000
Annual income (ln)	0.135	0.000	0.134	0.000	0.136	0.000
Annual household income (ln)	-0.014	0.077	-0.009	0.252	-0.013	0.107
Home ownership	0.083	0.002	0.087	0.001	0.086	0.002
Home purchase price (ln)	0.065	0.000	0.063	0.000	0.065	0.000
Current home value (ln)	-0.175	0.000	-0.181	0.000	-0.176	0.000
Mortgage outstanding (ln)	0.096	0.000	0.096	0.000	0.103	0.000
Business ownership	0.016	0.008	0.017	0.005	0.018	0.004
Finance related occupation	0.010	0.093	0.012	0.054	0.009	0.150
Employment: permanent contract	0.080	0.000	0.085	0.000	0.084	0.000
Unemployed	-0.001	0.922	-0.006	0.361	-0.001	0.933
Unemployed a year ago	-0.029	0.000	-0.026	0.000	-0.023	0.001
Education: first degree or above	0.085	0.000	0.086	0.000	0.083	0.000
R Square	0.191		0.192		0.190	

By employing the same dataset, Brown et al. (2005) have similar findings of the effect of financial expectations on unsecured debt borrowing. However, their main focus is on the effect of financial expectation instead of optimism as in this study. In this chapter, financial expectation is considered as one measure of financial optimism among other measures. I believe in this way, the implications of financial expectation can be understood in the context of previous literature rather than a random factor contributing to household portfolio choice. I also include the debt figure for 2005 which is not available in Brown et al. (2005).

Table 27 Financial optimism and the ratio of unsecured debt to total debt for all individual investors

This table reports the regression results for Equation 12. Variables listed in the left column including financial optimism and demographics are independent variables for the regression. The ratio of unsecured debt to total debt (PD/TD) in the first row is the dependent variable in the regression equation. Beta coefficients and the *p*-values associated with each coefficient are reported in the rest of the columns. *Financial expectation*, *A priori optimism*, and *A posteriori optimism* are used as measures of Financial optimism with coefficients and *p*-values reported respectively under each measure.

	Debt: PD/TD					
	Financial Expectation		**A Priori Optimism**		**A Posteriori Optimism**	
	Beta	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**
Financial Optimism	0.009	0.173	0.020	0.002	0.013	0.047
Age	0.160	0.000	0.158	0.000	0.165	0.000
Male	0.011	0.085	0.011	0.087	0.015	0.020
Married	-0.080	0.000	-0.081	0.000	-0.079	0.000
White	0.002	0.781	0.002	0.746	0.003	0.657
Healthy	0.007	0.268	0.008	0.229	0.004	0.538
Household size	0.019	0.009	0.018	0.010	0.017	0.021
Total financial wealth (ln)	-0.007	0.330	-0.005	0.438	-0.006	0.428
Annual income (ln)	0.043	0.000	0.043	0.000	0.049	0.000
Annual household income (ln)	-0.064	0.000	-0.063	0.000	-0.061	0.000
Home ownership	-0.251	0.000	-0.250	0.000	-0.244	0.000
Home purchase price (ln)	-0.149	0.000	-0.149	0.000	-0.149	0.000
Current home value (ln)	-0.293	0.000	-0.294	0.000	-0.292	0.000
Business ownership	-0.016	0.011	-0.016	0.012	-0.016	0.015
Finance related occupation	-0.011	0.094	-0.010	0.100	-0.011	0.096
Employment: permanent contract	-0.032	0.000	-0.031	0.000	-0.034	0.000
Unemployed	-0.006	0.418	-0.008	0.273	-0.003	0.649
Unemployed a year ago	0.002	0.769	0.003	0.669	0.002	0.722
Education: first degree or above	0.021	0.001	0.021	0.001	0.020	0.004
R Square	0.450		0.450		0.441	

Table 27 shows the relationship between financial optimism and the percentage of unsecured debt among one's total debt. The estimated coefficients show optimistic people have higher percentage of unsecured debt among their total debt than non-optimistic subjects, which supports my finding from Table 26 that optimistic people are more likely to borrow debt. The coefficients for optimism are 0.020 and 0.013 for *A priori optimism* and *A posteriori optimism* respectively. Financial optimism is highly positively correlated with borrowing unsecured debt is highly significant at the 95% confidence level.

Table 28 Financial optimism and the ratio of mortgage to total wealth for all individual investors

This table reports the regression results for Equation 13. Variables listed in the left column including financial optimism and demographics are independent variables for the regression. The ratio of mortgage to total wealth (MG/TW) in the first row is the dependent variable in the regression equation. Beta coefficients and the *p*-values associated with each coefficient are reported in the rest of the columns. *Financial expectation*, *A priori optimism*, and *A posteriori optimism* are used as measures of Financial optimism with coefficients and *p*-values reported respectively under each measure.

	Debt: MG/TW					
	Financial Expectation		**A Priori Optimism**		**A Posteriori Optimism**	
	Beta	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**
Financial Optimism	0.069	0.000	0.029	0.000	0.035	0.000
Age	-0.454	0.000	-0.466	0.000	-0.474	0.000
Male	-0.008	0.300	-0.006	0.461	-0.006	0.480
Married	0.180	0.000	0.179	0.000	0.185	0.000
White	-0.011	0.150	-0.012	0.140	-0.016	0.041
Healthy	0.013	0.088	0.015	0.066	0.015	0.070
Household size	-0.147	0.000	-0.149	0.000	-0.152	0.000
Total financial wealth (ln)	-0.203	0.000	-0.206	0.000	-0.204	0.000
Annual income (ln)	0.108	0.000	0.109	0.000	0.104	0.000
Annual household income (ln)	0.045	0.000	0.046	0.000	0.043	0.000
Home ownership	0.042	0.000	0.042	0.000	0.043	0.000
Home purchase price (ln)	0.192	0.000	0.192	0.000	0.189	0.000
Current home value (ln)	-0.271	0.000	-0.272	0.000	-0.269	0.000
Business ownership	0.021	0.010	0.023	0.004	0.023	0.005
Finance related occupation	0.014	0.089	0.016	0.051	0.012	0.144
Employment: permanent contract	-0.017	0.077	-0.014	0.140	-0.011	0.277
Unemployed	0.005	0.577	0.005	0.567	0.006	0.476
Unemployed a year ago	-0.019	0.026	-0.017	0.038	-0.020	0.016
Education: first degree or above	0.036	0.000	0.038	0.000	0.041	0.000
R Square	0.376		0.372		0.377	

The results in Table 28 show that financially optimistic investors have a higher proportion of mortgage among total wealth than non-optimists do. The estimated coefficients for the three measures of optimism are 0.069, 0.029 and 0.035 respectively and they are all significant at the 95% confidence level. These results again are consistent with the findings in Table 26 and Table 27: that financial optimism is positively correlated with taking on debt and therefore involves more risks in their optimistic portfolios.

4.5.3. Financial Optimism and Portfolio Choice for the Head of Households

Descriptive statistics in section 3.4.2 shows that the head of the household have higher wealth and income levels compared to the average individual in the BHPS. I suspect the head of the

household is also more likely to be the person who makes financial decisions for the whole family. Therefore it would be interesting to investigate whether optimism affects them in a similar manner as it influences other individuals when it comes to financial decision making. In this section, I check the robustness of findings on optimism and portfolio choice in section 4.5.2 by running the regression analysis on household heads only. I run the regressions for risk-free portfolios, risky portfolios and debt choices on the head of the household respectively. The estimated results are provided in the following tables.

Table 29 Financial optimism and the ratio of risk-free assets to financial wealth for the head of the household

This table reports the regression results for Equation 6. Variables listed in the left column including financial optimism and demographics are independent variables for the regression. The percentage of savings to financial wealth (SAV/FW) in the first row is the dependent variable in the regression equation. Beta coefficients and the *p*-values associated with each coefficient are reported in the rest of the columns. *Financial expectation*, *A priori optimism*, and *A posteriori optimism* are used as measures of Financial optimism with coefficients and *p*-values reported respectively under each measure.

	Risk-free Portfolios (Head of the Household): SAV/FW					
	Financial Expectation		**A Priori Optimism**		**A Posteriori Optimism**	
	Beta	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**
Financial Optimism	-0.011	0.229	-0.054	0.000	-0.016	0.084
Age	-0.055	0.000	-0.057	0.000	-0.051	0.000
Male	-0.063	0.000	-0.063	0.000	-0.065	0.000
Married	0.018	0.181	0.018	0.184	0.021	0.121
White	0.003	0.721	0.003	0.760	0.007	0.465
Healthy	-0.021	0.020	-0.023	0.013	-0.017	0.066
Household size	-0.025	0.036	-0.022	0.059	-0.025	0.042
Annual income (ln)	-0.027	0.068	-0.026	0.070	-0.026	0.082
Annual household income (ln)	-0.025	0.120	-0.029	0.078	-0.026	0.123
Home ownership	0.106	0.010	0.106	0.010	0.108	0.010
Home purchase price (ln)	-0.051	0.000	-0.049	0.000	-0.051	0.000
Current home value (ln)	-0.213	0.000	-0.212	0.000	-0.213	0.000
Mortgage outstanding (ln)	0.042	0.001	0.042	0.001	0.039	0.002
Business ownership	-0.017	0.059	-0.017	0.068	-0.020	0.038
Finance related occupation	-0.056	0.000	-0.057	0.000	-0.059	0.000
Employment: permanent contract	0.035	0.010	0.032	0.017	0.040	0.003
Unemployed	0.001	0.949	0.006	0.548	-0.001	0.897
Unemployed a year ago	-0.001	0.926	-0.004	0.697	-0.001	0.939
Education: first degree or above	-0.073	0.000	-0.074	0.000	-0.072	0.000
R Square	0.051		0.054		0.051	

The estimated results shown in Table 29 are consistent with my main findings from Table 21 that optimistic investors have lower ownership of risk-free assets among their financial wealth.

A priori optimism and *A posteriori optimism* are both significant at the 95% confidence level. Some effects of the demographic variables, such as being married, become insignificant.

Table 30 Financial optimism and the ratio of risky assets to financial wealth for the head of the household

This table reports the regression results for Equation 9. Variables listed in the left column including financial optimism and demographics are independent variables for the regression. The percentage of investment to financial wealth (INV/FW) in the first row is the dependent variable in the regression equation. Beta coefficients and the *p*-values associated with each coefficient are reported in the rest of the columns. *Financial expectation*, *A priori optimism*, and *A posteriori optimism* are used as measures of Financial optimism with coefficients and *p*-values reported respectively under each measure.

	Risky Portfolios (Head of the Household): INV/FW					
	Financial Expectation		**A Priori Optimism**		**A Posteriori Optimism**	
	Beta	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**
Financial Optimism	0.011	0.229	0.054	0.000	0.016	0.084
Age	0.055	0.000	0.057	0.000	0.051	0.000
Male	0.063	0.000	0.063	0.000	0.065	0.000
Married	-0.018	0.181	-0.018	0.184	-0.021	0.121
White	-0.003	0.721	-0.003	0.760	-0.007	0.465
Healthy	0.021	0.020	0.023	0.013	0.017	0.066
Household size	0.025	0.036	0.022	0.059	0.025	0.042
Annual income (ln)	0.027	0.068	0.026	0.070	0.026	0.082
Annual household income (ln)	0.025	0.120	0.029	0.078	0.026	0.123
Home ownership	-0.106	0.010	-0.106	0.010	-0.108	0.010
Home purchase price (ln)	0.051	0.000	0.049	0.000	0.051	0.000
Current home value (ln)	0.213	0.000	0.212	0.000	0.213	0.000
Mortgage outstanding (ln)	-0.042	0.001	-0.042	0.001	-0.039	0.002
Business ownership	0.017	0.059	0.017	0.068	0.020	0.038
Finance related occupation	0.056	0.000	0.057	0.000	0.059	0.000
Employment: permanent contract	-0.035	0.010	-0.032	0.017	-0.040	0.003
Unemployed	-0.001	0.949	-0.006	0.548	0.001	0.897
Unemployed a year ago	0.001	0.926	0.004	0.697	0.001	0.939
Education: first degree or above	0.073	0.000	0.074	0.000	0.072	0.000
R Square	0.051		0.054		0.051	

The estimated results shown in Table 30 support my findings on all individuals in Table 24: that financial optimism has a positive impact on choosing risky portfolios. The coefficients for *A priori optimism* and *A posteriori optimism* are 0.054 and 0.016 respectively and both are significant at the 95% confidence level.

Table 31 Financial optimism and the amount of unsecured personal debt for the head of the household

This table reports the regression results for Equation 11. Variables listed in the left column including financial optimism and demographics are independent variables for the regression. The amount of personal debt (LN(PD)) in the first row is the dependent variable in the regression equation. Beta coefficients and the *p*-values associated with each coefficient are reported in the rest of the columns. *Financial expectation*, *A priori optimism*, and *A posteriori optimism* are used as measures of Financial optimism with coefficients and *p*-values reported respectively under each measure.

	Debt (Head of the Household): Ln (PD)					
	Financial Expectation		**A Priori Optimism**		**A Posteriori Optimism**	
	Beta	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**
Financial Optimism	0.051	0.000	0.054	0.000	0.031	0.000
Age	-0.249	0.000	-0.256	0.000	-0.251	0.000
Male	0.016	0.108	0.016	0.101	0.017	0.093
Married	-0.024	0.045	-0.024	0.040	-0.023	0.057
White	0.010	0.226	0.010	0.232	0.009	0.258
Healthy	0.003	0.677	0.005	0.555	0.003	0.736
Household size	0.032	0.003	0.029	0.007	0.030	0.006
Total financial wealth (ln)	-0.157	0.000	-0.156	0.000	-0.159	0.000
Annual income (ln)	0.014	0.291	0.012	0.357	0.017	0.200
Annual household income (ln)	0.059	0.000	0.064	0.000	0.056	0.000
Home ownership	0.043	0.249	0.046	0.217	0.052	0.166
Home purchase price (ln)	0.005	0.669	0.004	0.718	0.007	0.569
Current home value (ln)	-0.075	0.051	-0.081	0.033	-0.087	0.026
Mortgage outstanding (ln)	0.118	0.000	0.119	0.000	0.123	0.000
Business ownership	0.017	0.038	0.018	0.028	0.019	0.026
Finance related occupation	0.009	0.254	0.011	0.175	0.011	0.197
Employment: permanent contract	0.044	0.000	0.049	0.000	0.046	0.000
Unemployed	-0.001	0.916	-0.005	0.568	0.003	0.773
Unemployed a year ago	-0.032	0.000	-0.029	0.002	-0.034	0.000
Education: first degree or above	0.058	0.000	0.060	0.000	0.058	0.000
R Square	0.236		0.237		0.231	

In Table 31, the estimated coefficients are consistent with my findings in Table 26: that financially optimistic people borrow more debt, indicating they prefer higher risk levels in their portfolios. The head of the household is slightly less affected by optimism in terms of borrowing personal debt than the average individual in the BHPS. The coefficients for optimism become slightly smaller (0.051, 0.054 and 0.031) compared to the coefficients for optimism for all individuals (0.054, 0.063 and 0.033) in Table 26. However, financial optimism still has a positive relationship with borrowing unsecured debt at 95% confidence level. The effects of demographics on debt choice for household heads remain very similar to the effects on all individuals in Table 26.

4.5.4. Summary

In section 4.5, I provided regression results that support my research hypothesis: individuals who are financially optimistic prefer risky portfolios to risk-free portfolios. Table 20 to Table 31 shows evidence that financial optimism has a negative relationship with the amount of savings and investment an individual has. Financial optimism is positively correlated with the ratio of investment to financial wealth but is negatively correlated to the ratio of savings to financial wealth, which indicates optimism is positively associated with preferences in risky portfolios. Optimists take on more unsecured debt and therefore have a higher risk level in their portfolios. Among the three measures of optimism, *A priori optimism* has the strongest correlation with portfolio choice followed by *A posteriori optimism* and *Financial expectation*. I verified the robustness of the above results by repeating the regression analysis for the head of the households only in the BHPS and obtained similar significant findings.

By exploring the difference between optimists, pessimists and neutral respondents, I found that optimists have different demographic characteristics compared to pessimists or neutral respondents. Optimists are significantly younger, more likely to be male, have higher educational qualifications, are more likely to have business ownership, but have lower accumulated wealth than pessimistic or neutral respondents. I also find that optimistic people borrow more unsecured personal debt and take on a larger mortgage.

The reader is reminded that the regression analysis of BHPS data in section 4.5 can only reveal the correlation between independent and dependant variables. Correlation does not imply causality (Pearson, 1910). The BHPS does not encode relevant detailed lagged data from subjects for my analysis and therefore I was unable to conduct specific statistical tests for causality such as the Granger causality test (Granger, 1969). Although I speculate from my correlation results that financially optimistic investors are more risk friendly when making

investment decisions, it is possible that these correlations emerged because of another causal relationship that caused investors to be both optimistic and risk friendly. This chapter does not investigate further into the causality between optimism and portfolio choices but I hope my results will encourage future work in this direction.

4.6. Conclusion

Previous literature shows optimism affects many economic phenomena and economic decision making (Gervais, Heaton, and Odean, 2002; Heaton, 2002; Hackbarth, 2007; Lee, Shleifer, and Thaler, 1991; Easterwood and Nutt, 1999; Kacperczyk and Kominek, 2002). But how optimism affects household portfolio choices has not been sufficiently studied. Perhaps this is due to the difficulties of measuring optimism in real life. In this chapter, I used three measures for financial optimism defined in Chapter 3 and examine the role of financial optimism in household portfolio choice by employing data from the British Household Panel Survey (BHPS).

In this chapter, by comparing the profile of optimists to non-optimists, I found that financial optimism exists widely amongst the younger population with lower accumulated wealth. A significantly higher percentage of optimists are unemployed than the unemployment rate of pessimistic or neutral respondents. Empirical evidences in this study demonstrate that financial optimism is positively correlated with households' preferences of risky portfolios and a negative impact on their investment in risk-free portfolios. Financially optimistic individuals also borrow higher level of debt than non-optimists indicating they have higher risk preferences in their portfolios. Among the three measures of financial optimism in this study, *A priori optimism* had the strongest correlation with portfolio choice followed by *A posteriori optimism* and *Financial expectation.*

I believe this chapter made the following contributions. First, it used the innovative measures of financial optimism introduced in Chapter 2, and these measures implemented with the BHPS data have never been used before in studying optimism and household portfolio choices. Secondly, since there is little empirical evidence on whether financial optimism influences

households' portfolio choices, this study fills a research gap on the role of optimism in household portfolio choice. Thirdly, findings from this study could help individuals and households realized the psychological influence on their portfolios choices and rationalise their investment behaviour. Last but not least, the UK household data has not been used in any previous research in this area, which provides potential comparisons with similar research conducted in other countries.

The limitation of this study is that it only studied whether financial optimism is correlated with more risky investment but does not reveal whether such optimism is beneficial. Results in this chapter seem to suggest that optimists are financially worse off than non-optimists. Therefore I wonder whether being optimistic is a disadvantage in terms of improving one's financial status. It is also intriguing to find out whether worse off individuals uses optimism as a psychological cure to stay happy or satisfied with themselves. These unanswered questions lead to my research in the next chapter which investigates how financial optimism is related to individuals' objective and subjective well-being.

Chapter 5

Is it Better to be Optimistic?

- Financial Optimism and Well-being

5.1. Introduction

In chapter 4, I found that if investors are optimistic about their future financial situation, they are more likely to invest in risky portfolios than risk-free assets. However, I did not study further whether financial optimism is beneficial to increasing individual investors' current and future income or wealth level. It is also not clear if financial optimism is a kind of strategy individuals use to stay positive and feel happy or satisfied about themselves. Research in this chapter empirically tackles these unanswered questions. I investigate whether financial optimism benefits individuals' current and future well-being by analyzing the BHPS data. In addition, I hope to explore whether optimism is rational behaviour to improve one's future material well-being or whether is it a psychological illusion people create to feel good about themselves. The layout of this chapter is explained as follows.

Section 5.2 introduces the existing literature on optimism and well-being. It shows that general optimism has both beneficial and undesirable effects on well-being. Optimism amplifies the efficacy of medicines in curing illness, encouraging individuals to take on ambitious tasks, behaving tough when encountered with difficulties (Gollier, 2005; Weinstein & Lyon, 1999; Bénabou & Tirole, 2002). On the other hand, optimism could lead to the neglect of risk and bias people's perceptions of the probability of achieving favourable outcomes (Weinstein & Lyon, 1999). Optimism could also increase current felicity but lower future felicity (Gollier, 2005). Following the literature on the dual nature of optimism, I look into works on individuals' well-being, in particular the variables that are proved to have effects on objective and subjective well-being. A number of demographics such as age, gender, employment status and education level are demonstrated to have influences on both objective and subjective well-being (Ben-Porath, 1967; Benzoni, Collin-Dufresne, & Goldstein, 2007; Cummins, 2000). Subjective determinants are thought to have strong effects on subjective well-being (Cummins, 2000a).

Section 5.3 proposes my research hypothesis after discussing my research rationale for this chapter. Section 5.4 re-emphasizes the data and the definition of financial optimism that is going to be used for the analysis in the chapter. It then defines variables representing objective and subjective well-being which will be used as dependent variables in the regression analysis. Objective well-being refers to one's wealth and income level while subjective well-being refers to an individual's happiness and satisfaction. Regression models are then specified with optimism and demographics used as independent variables.

Section 5.5 carries out the regression analysis to explore the relationship between financial optimism and objective as well as subjective well-being. I found that optimism is negatively correlated with both current financial wealth and total wealth, which is consistent with my findings that optimists are on average financially worse off than non-optimists in chapter 4. Optimists' future financial wealth does seem to improve in a few years' time, although their overall wealth level is not significantly higher than non-optimists in future. This perhaps is due to the fact that optimists work harder to improve their living status as suggested by some previous literatures (Puri & Robinson, 2007). The fact that optimists' total wealth increase is still lower than non-optimists might be due to the increased house values which is the biggest components of my total wealth measure. *Financial expectation* has positive correlations with current happiness and satisfaction which is consistent with previous findings in literature regarding general optimism and subjective well-being. But optimism measures with benchmark components (*A priori optimism* and *A posteriori optimism*) have little effect on current subjective well-being. However *A posteriori optimism* is negatively correlated with an increase in future happiness. Section 5.6 concludes this chapter.

My findings in this chapter imply that being optimistic helps to increase one's future financial situation but because optimists tend to start off with worse off financial situations, the positive

effect of optimism is very limited in terms of surpassing the originally better off individuals. The correlations between financial optimism and subjective well-being suggest people may try to stay financially optimistic to make themselves happy or be satisfied with themselves for the time being, however the exact causality is unknown. Low realisation of expected outcomes (high *A posteriori optimism*) is likely to result in a decrease in future happiness. Overall, it is better to be optimistic as it helps to increase future objective well-being although such increase is probably not significant enough to achieve material superiority. Staying optimistic could also improve mental status and make one feel happy and satisfied, however one should be aware of that if the realised outcome of the financial decision falls short of expectation, future felicity might be affected adversely.

I believe research in this chapter is the first to cohesively study the benefit of optimism in terms of whether it improves objective well-being as well as subjective well-being. In this way, the conclusions on whether it's beneficial to be optimistic are much more comprehensive. Not many previous models on optimism and its potential benefit are tested using field data. In addition, I studied optimism in a financial decision making domain and the relationships between financial optimism and well-being have never been studied before.

5.2. Literature Review

This literature section reviews studies on the advantages and disadvantages of optimism in section 5.2.1. The literature tells the two-sided story of optimism. Optimism can help people sustain motivations and therefore could help to reach success (Bénabou & Tirole, 2002) but at the same time it might increase the tendency of neglecting risks and could be harmful (Weinstein & Lyon, 1999; Gollier, 2005). Section 5.2.2 reviews the determinants affecting objective and subjective well-being. The literature on these determinants helps to identify control variables for my analysis in this chapter. Section 5.2.3 summarises this literature review section.

5.2.1. Advantages and Disadvantages of Optimism

Prior literature shows pros and cons of being optimistic. Firstly, I review the advantages of optimism. Optimism has been shown to have benefits towards one's physical welfare as well career success (Gollier, 2005; Weinstein & Lyon, 1999). It also presents a confident image of oneself and signals positive information to others (Trevelyan, 2008; Bénabou & Tirole, 2002). On the other hand, by reviewing the disadvantages of optimism, I found optimism could be harmful because it biases people's perceptions of the probabilities of achiving favourable outcomes followed by certain decisions (Gollier, 2005). Optimism could also raise current happiness but lower future felicity (Gollier, 2005).

a) Advantages

As early as in the late nineteenth century, psychologists start noticing the beneficial effects of optimistic thinking. A French psychologist, Émile Coué, at the University of Nancy introduced

a method of psychotherapy which was based on the idea that learning to manipulate one's thoughts can improve one's physical well-being (Gollier, 2005). Coué believed that curing some illnesses requires changes in one's unconscious thought. By praising the effectiveness of a given medicine to the patient, he noticed that the patients had improvements compared to others to whom he did not praise the medicine. He claimed that the inner resources and imagination is able to amplify the efficacy of medicines and help a person improve her mental and physical status.[1] Coué's theory and experiments indicate having an optimistic expectation could potentially improve one's physical well-being.

Besides the possible effect of optimism in curing diseases and improving one's physical well-being, optimism is also found to influence the pursuit of success in one's career. Weinstein and Lyon (1999) point out that optimism about reaching goals could help to maintain perseverance and sustain motivation when progress is difficult. Thinking positively benefits people by assisting them to overcome obstacles. Not only does optimism support individuals to persevere to achieve their goals, a "can do" optimistic attitude and confidence in one's ability improves motivation which encourages individuals to initiate ambitious tasks, such as getting into university, starting a business, winning a medal, writing a great book, and doing innovative research, etc (Bénabou & Tirole, 2002). Optimism[2] leads to the belief that favourable outcomes will occur. Optimists have a positive outlook on life and tend to pay more attention to favourable life events. If entrepreneurs are optimistic, they are more likely to focus on the positive side of a situation and ignore the setbacks in developing a business (Trevelyan, 2008).

Bénabou and Tirole (2002) suggest that optimism could be "wired in" as a result of evolution

[1] http://www.durbinhypnosis.com/coue.htm

[2] Optimism was measured using the life orientation test (LOT) (Scheier et al., 1994). It is an eight-item measure where respondents are asked to rate on a five-point response scale the extent to which they agree with statements, for example "I always look on the bright side of things", and "I hardly ever expect things to go my way (reverse scored)". (Trevelyan, 2008)

which has selected a particular cognitive bias in humans,[1] causing them to systematically under-weigh adverse signals and overweighs positive information. Optimism is a trait that generates a confidence that positive outcomes will occur (Trevelyan, 2008). According to Bénabou and Tirole (2002), a higher confidence level strengthens one's motivation to achieve a good performance and maintain one's self-esteem. They claim that confidence in one's ability has signalling value. It makes it easier to convince others that one has such qualities as people prefer to work with self-confident colleagues or teammates to self-doubting colleagues in economic interactions.

The above literature suggests that optimism seems to be a rather valuable asset contributing to people's objective well-being in terms of curing diseases and succeeding in careers and other social activities. People who are optimistic are more likely to have a firm mind and behave tough when encountered with difficult situations. Optimistic thinking could lead to a confident personality, which makes a person more easily to survive or be popular in social interactions. However, as I found in my earlier research and literature survey in chapter 4, people who have optimistic outlooks for future might neglect risks. In the next section I look into some negative effects of optimism.

b) Disadvantages

Some academics argue that though optimistic thinking helps to create a positive attitude towards certain situations and therefore individuals are more likely to get through obstacles, playing with the psychological illusions could be dangerous for one's well-being (Weinstein & Lyon, 1999; Gollier, 2005).

[1] Bénabou and Tirole (2002) also suspect that "This explanation is rather problematic: the extent of overconfidence or overoptimism varies both over time and across tasks, and a great many people actually suffer from underconfidence (the extreme case being depression). Furthermore, individuals often "work" quite hard at defending their self-image when it is threatened, going though elaborate schemes of denial, self-justification, furniture- avoidance, and the like".

The neglect of risks is one of the chanels through which optimism could lead to harmful consequeses. Gollier (2005) points out that the so-called "method Coué" which uses autosuggestion to enhance medical effects has an undesirable effect because artificially downgrading the risk could make the patient spend less effort to fight the disease. Weinstein and Lyon (1999) argue that it is important to recognise that optimistic biases do lead to harm. They discuss the relationship between optimism and the chance of catching diseases even if these are of low probabilities. Though few adults will suffer from AIDS, a large percentage will contract other sexually transmitted diseases because they were under the positive illusion that their partners are unlikely to carry diseases. Even if the proportion of people who catch such diseases because of an optimistic bias about risk is low, the total number of people who suffer may be large and undesirable from the perspective of public health. People who believe that their risk is lower than their peers are less likely to take precautions than those who acknowledge personal risk. A reluctance to acknowledge personal vulnerability appears to be a major reason why people fail to take appropriate precautions.

Optimism also biases people's perceptions of the chances of achiving favourable outcomes followed by decisions. Gollier (2005) claims that the distortion of beliefs affects the individual decision process in a complex manner. Particularly in the context of portfolio choice, optimism implies a mental manipulation of the objective probability distribution of the return on investment. This manipulation of beliefs is likely to affect investors' asset allocation. Abel (2002) shows in his theoretical framework that pessimistic consumers try to reduce current consumption and increase current saving. This attempt to increase current savings reduces the interest rate and increases investment in risk-free assets as well as the average equity premium. Empirical evidence from my research in chapter 4 shows that financial optimism is negatively correlated with an investment in risk-free assets, however whether optimistic bias actually causes a reduction in investment returns is yet unknown.

The above discussion and literature show that optimism could have a negative effect on individuals' objective well-being in both health and economic areas. Optimism also potentially improves one's subjective feelings. Bénabou and Tirole (2002) found that being optimistic about one's ability creates a better self-image and therefore makes a person happier. Hey (1984) presents the idea that optimists are more hopeful about good things than pessimists, and less fearful about bad things. Gollier (2005) believes the anticipation of future pleasures and displeasures affects current felicity. People's positive thinking about the likelihood of future events has a direct effect on their current mental welfare. However, if future events turn out to be undesirable, the future happiness or satisfaction would be reduced. In another word, optimism raises current felicity but lower future felicity.

5.2.2. Determinants of Objective and Subjective Well-being

"The question of what makes for a good life can be studied at many different levels. … Objective characteristics of a society, life poverty, infant mortality, crime rate, or pollution, figure prominently at this level. Though these qualifications are important, the experience of pleasure and the achievement of a subjective sense of well-being remain at the centre of the story. " (Kahneman, Diener, & Schwarz, 1999)

Objective well-being is usually connected to a list of requirements that people should satisfy to lead a good life. These requirements include objective measures when assessing well-being, welfare or developmental achievements, such as income, consumption or availability of housing, school or health facilities in the societies (Royo & Velazco, 2006).

Subjective well-being is based on self-reports of happiness and life satisfaction. However, such reports of subjective well-being might not reflect a stable inner state of well-being, and are

judgments that people form at a particular point of time based on information that is temporarily accessible at that moment (Kahneman, Diener, & Schwarz, 1999). The ongoing debate on the accuracy of self reported well-being and whether objective or subjective measures are better at capturing well-being are beyond the scope of this chapter. I will focus on the previous empirical evidence on what factors contribute to well-being and explore the effect of financial optimism on changes in well-being.

5.2.2.1. Factors Affect Objective Well-being

In this section, I review literature on the factors that contribute to the change of objective well-being which consists of social and material attributes, among which income and wealth are the mostly investigated objective indicators of objective well-being. Previous research suggests that demographic factors affect one's income and wealth level. In particular, an individual's earnings growth is explainable by education, experience, gender, and ethnicity (Ben-Porath, 1967). Different households have different consumption patterns (Ferber & Lee, 1980) and a high income growth family might not accumulate as high wealth if their main expenditure is on non-durable goods. Therefore, I include wealth as another indicator of objective well-being.

Age is an important component in capturing lifecycle predictability. Labour income tends to increase with age when an individual is young, and then decline as she approaches retirement (Benzoni, Collin-Dufresne, & Goldstein, 2007). Middle age seems to be a turning point in the curve of income growth. The bulk of the future income of a young consumer is derived from her forthcoming salary in her middle age, while the future income of a middle-aged consumer is generated primarily from her savings in equity and bonds (Constantinides, 2002). During most of the retirement period, both labour income and wealth decrease at similar rates (Gomes & Michaelides, 2005).

Ferber and Lee (1980) studied the asset allocation among couples in their early marrital life and found some interesting interactions between marital status, gender, and wealth. They found that the age of husbands is positively corelated with families' net asset and total debt. Another household characteristic - household size might also have an impact on the wealth level. Powdthavee (2007) found in his study that there is a positive and statistically significant relationship between household size and reported economic status. Households with high ratios of children and pensioners appear to perceive themselves as poorer than others in Indonesia. By studying the wealth accumulation of black and white families in the US, Terrell (1971) also found that the net wealth position of black families is substantially poorer than that of white families of similar characteristics. The reason appears to relate to the fact that black families have had a past history of lower average income than white families of the same income level.

Rosen and Wu (2004) studied the role health status plays in household portfolio decisions using data from the Health and Retirement Study. They found that households in poor health are less likely to hold all kinds of financial assets if other conditions such as the level of total wealth are the same. However, it is not clear through what channels health status affects household asset holdings. An earlier study by Kochar (1995) suggests that there might be no allawance compensating wage loss due to illness among certain professions in some areas. In his sample, 39 percent of the households reported a loss of working days due to illness in any givern year, while the poor appear especially vulnerable when facing such income risk caused by illnesses.

Employment status is also an important determinant of total wealth. It was found in general that those who report themselves as self-employed have substantially more wealth on average, but have a less positive relationship between income and wealth than those who report being employed by others (Terrell, 1971). This is because the self-employed represent an entrepreneurial class whose income is more dependent on business than on human capital and hence would be expected to have more measurable wealth.

Firm size and having a permanent employment contract have been found to affect employees' income. Firm size is measured by the number of employees a firm has in most literature. By analysing data from the Survey of Labour and Income Dynamics (SLID) over the years 1994–2001, Ferrer and Lluis (2008) found evidence that returns to measured skills are significantly greater in the largest firms (1,000 plus employees) than in medium-sized firms (100–499 employees), and returns to unmeasured ability is larger in medium-sized firms than in smaller firms and larger firms with more than 1,000 employees. Despite wage premium being overshadowed by the superior endowments of workers in large firms, small firms actually pay higher wages based on how they value their workers' endowments (Hettler, 2007). By investigating the relationship between employee attitudes, earnings and fixed-term contracts employing data from the British Social Attitudes Survey and International Social Survey Programme, Brown and Sessions (2005) found that workers employed under fixed-term contracts receive significantly lower earnings than their permanent contract counterparts. Workers employed under permanent contracts are more likely to be satisfied and secure with their job, but are also more likely to feel stressed and exhausted.

Given the same income and age, a higher level of education is associated with a greater amount of wealth accumulation. Families who have had high average levels of past income are likely to have high levels of current income. The education level of the head of the household is related with such processes of wealth accumulation (Terrell, 1971). There is an apparent positive relationship between income growth and the level of the real interest rate. This positive relationship increases significantly with educational level and is especially significant for households where the household head has a college education (Munk & Sørensen, 2010). Munk and Sørensen (2010) plotted average income, consumption, and financial wealth over the life-cycle for college graduates and for individuals with no high school education. They find that income increases more rapidly to a considerably higher level for college graduates which

leads to higher consumption and higher financial wealth throughout life. However, the financial wealth of college graduates in their early years is lower than the financial wealth of individual without a high school degree, which is because the college graduate who foresees the higher future income has higher initial consumption.

When measuring the level of financial wealth, Ferber and Lee (1980) found that homeownership has a significantly positive impact on households' debt and debt could explain fluctuations in net assets. They test the relationship between debt and asset accumulation. Much of the debt incurred by young couples was for purchasing appreciating assets such as properties. Total debt is affected strongly by homeownership. Change in gross assets is dominated by the change in debt level.

Besides the demographic variable discussed above, some other factors such as the year income is generated, could have an impact on income growth. By the analyzing data from the Panel Study of Income Dynamics, Munk and Sørensen (2010) found income is highly correlated for the sub-period 1970 to1992 and there is a positive relationship between income growth and the level of the real interest rate. They then calibrate the model to quarterly U.S. aggregate income data and capital market data obtained from the National Income and Product Accounts (NIPA) which spans the period 1951 - 2003 and the income estimations indicates a significant real growth in income of 1.81% per year for the whole period.

In my research, I use respondents' age, gender, marital status, ethnicity, health status, employment status, educational level, year of interview and whether individuals have home ownership as the control variables to isolate the effect of financial optimism on changes in income and wealth. In order to measure the different aspects of employment status, I include variables appearing in previous literature such as whether respondents are self-employed, unemployed, work in finance or business related sectors, have a permanent contract and the size

of the firm where they work. In addition to if individuals are unemployed in the year of interview, I also look at the effect of being unemployed a year ago as I suspect being unemployed at the time the BHPS interview takes place might not have an immediate effect on individuals' income that year. I expect age, gender, health status, employment status and education have a significant impact on income and wealth levels. The effect of financial optimism on objective well-being has not been studied before and I will include this new variable to investigate its influence.

5.2.2.2. Factors Affect Subjective Well-being

There is reason to believe that optimism influences or will be influenced by well-being (Kahneman, Diener, & Schwarz, 1999). Empirical evidence finds optimism, along with other factors, has an effect on subjective well-being. But such optimism is defined in most studies on well-being as a general positive outlook for the future without a benchmark (Dember & Brooks, 1989; Lucas, Diener, & Suh, 1996). In this study, I am more interested in the effect of a particular type of optimism, financial optimism, on future well-being. I include innovative definitions of financial optimism measured against individuals' rational expectation for the future, which I believe is a more accurate approach in defining optimism than previous measures.

A lot of what we know about individuals' subjective well-being (SWB) is based on self-reported happiness and life satisfaction (Kahneman, Diener, & Schwarz, 1999). SWB refers to individuals' evaluation of their lives, including both cognitive judgments of life satisfaction and affective evaluations of moods and emotions. The generic term of Subjective Well-Being includes measures of satisfaction, happiness as well as other cognitive components (Cummins, 2000). Satisfaction can be described either as the aggregate of satisfaction across a number of life domains or just a single score of satisfaction on life as a whole. A measure of happiness is

derived from a single BHPS question regarding how happy people feel with their 'life as a whole'.

a) Demographic Determinants

Questions such as "Can money buy happiness?" are often asked when investigating what influences subjective well-being. While most people believe that they would be happier if they were richer, survey evidence suggests otherwise (Kahneman, Krueger, Schkade, Schwarz, & Stone, 2006). When people assess the impact of any single factor on their well-being including income, they are likely to overstate its importance and this tendency was referred to as the focusing illusion in Kahneman, et al. (2006). They suggest there are modest correlations between income and judgments of life satisfaction or overall happiness, but these correlations do not contribute to an exaggerated effect of income on subjective well-being.

Literature shows that the simple purchase of objective materials is unlikely to have much impact on SWB and the effect of purchasing large houses and other luxurious items on SWB quickly fades away as the recipients adjust to such inputs (Cummins, 2000). However, the short-term happiness or satisfaction derived from instant consumption could be used as basic units in forming happiness as the average of utility over a period of time (Kahneman, Diener, & Schwarz, 1999).

On the other hand, money can affect SWB in more subtle ways. Wealthy people have a much better chance of avoiding compromise on their SWB homeostatic systems (Cummins, 2000). Wealthy individuals have access to good nutrition and medical care, which means they are less likely to suffer from a weakening medical condition and they can afford professional assistance to minimise the negative impact on their quality of life. Therefore wealth protects against unhappiness by improving and maintaining their SWB homeostatic system (Ahuvia &

Friedman, 1998). Among people with low income and disability, the importance of wealth is highly ranked in contributing towards samples' living quality (Bach & McDaniel, 1993; Mercier, Peladeau, & Tempier, 1998). However, quantitative research needs to be conducted to test whether an actual increase in wealth would lead to higher levels of SWB among the low wealth population (Cummins, 2000).

Based on the above literature it seems that for the rich, wealth can enhance instant happiness but most likely this only lasts for a short period of time or affects their general happiness via indirect channels. For the poor, wealth is considered important to increase happiness but the actual effect of wealth is uncertain. According to Cummins (2000), investigating the relationship between wealth and SWB at the individual level is not without its difficulties. This is because wealth might not influence SWB directly but instead, wealth has close links to other objective variables and those variables could affect SWB in their own right. Therefore differentiating the influence among wealth related demographical variables on SWB is complicated. Among objective variables, it is found in some previous literature that gender has no direct influence on the level of SWB and education level alone has a minor positive influence which is hardly significant (Cummins, 1995; Cummins, 2000; Zautra, 1983; Judge & Locke, 1993). According to these studies, the fact that someone has low SWB cannot be blamed on their gender or education alone. However, highly educated individuals tend to have higher aspirations (Heylighen & Bernheim, 2000). In between-country comparisons, education has a significant positive correlation with quality of life (Veenhoven, 1996a).

Some other demographic variables, such as health and employment status repeatedly display prominent influences on SWB. Poor health and unemployment both lower SWB (Kokko & Pulkkinen, 1998; Cummins, 2000). People with good mental health and empathy have greater life satisfaction (Veenhoven, 1996b). Employment is shown to be an important part of happiness. Peter Warr concludes in his book "Psychology at work" that subjective well-being is

"significantly associated with better job performance, lower absenteeism, reduced probability of leaving an employer and the occurrence of more discretionary work behaviour" (Vittersø, 2000). Various studies have suggested that self-employment enhances happiness and satisfaction (Benz & Frey, 2008; Bradley & Roberts, 2004; Parasuraman & Simmers, 2001). Benz and Frey (2008) found being self-employed generates higher satisfaction from work than those employed by companies, and this satisfaction is irrespective of income gained or hours worked. This finding implies people value not only outcomes but also the processes leading to outcomes. Part of the relationship between satisfaction and self-employment is explained by higher levels of self-efficacy and lower levels of depression among the self-employed compared to others (Bradley & Roberts, 2004).

Zullig, Huebner and Pun (2009) studied life satisfaction in different life domains among college students. They found that the overall mean scores did not differ significantly by gender, years in school or race. But in the domains of satisfaction with school and with self, effects were observed for race, where Caucasian students reported greater satisfaction with school and self than minority students. Other research shows self satisfaction varies across ethnicities. Twenge and Crocker (2002) found African - Americans had higher levels of self-esteem when compared with Caucasians while Hispanics, Asians, and Native Americans had lower self-esteem scores. They suggest that the differences in self-esteem between ethnicities appear to be partially explained by cultural differences in self concept though these factors are not the only contributors.

Other variables including religion, marriage and close friendship also play important roles in one's happiness and satisfaction. In fact nothing seems to boost happiness like social relationships if they work well, and valuing the inter-relationships above material possessions seems to make for a better life (Vittersø, 2000).

b) Subjective Determinants

Cummins (2000) argues that other subjective variables rather than objective variables tend correlate with subjective variables such as subjective well-being. In other words, demographic factors accounted for a low proportion of SWB (Vittersø, 2000). Cummins (2000) concludes that previous studies trying to predict SWB by income and subjective variables such as self-esteem find no significant variance contributed by income, emphasising the importance of subjective determinants.

Optimism is one of the subjective indicators that have effects on Subjective Well-Being. Life satisfaction is not only under the influence of past experience but is derived from some form of psychological process such as a predominantly positive view of life (Cummins & Nistico, 2002). Level of satisfaction is strongly associated with satisfaction with self. In order to feel satisfied and happy with life, satisfaction with self would be required. Self-satisfaction rests on three related beliefs: self-worth, perceived control and optimism. These three beliefs together are thought to contribute to the generation of life satisfaction. Some research shows optimism and household income account for a significant proportion of 25% of life satisfaction (Christensen, Parris Stephens, & Townsend, 1998). There is a strong correlation between optimism which was measured by questions such as “I generally look at the brighter side of life” and happiness (Dember & Brooks, 1989). Their findings also suggest that general optimism regarding oneself is closely linked to life satisfaction. However, the direction of causality in these relationships has not been determined (Kahneman, Diener, & Schwarz, 1999).

The theory behind the relationship between optimism and satisfaction and happiness is explored in some studies. Research indicates that self-enhancement, control, and optimism is associated with higher motivation, persistence, effective performance and ultimately greater success as they can create feelings of self-fulfilment. They help individuals work hard under situations

with poor probabilities of success, which pay off more often at the end than for individuals who lack persistence (Taylor & Brown, 1988). Scheier and Carver (1985) describe optimism as a general tendency to expect a favourable outcome in one's life. If people believe that their efforts will lead to a favourable outcome they will persist in their actions, whereas if they believe that failure is inevitable they will withdraw their efforts and give up on goals they set. Optimists should achieve more and better things should happen to them because their positive expectations lead to the actions that bring them closer to their success. On the other hand, pessimists may give up too early and end up experiencing fewer positive and more negative consequences.

This underlying logic between optimism and subjective well-being has previously been restricted to general optimism of life, and the theoretic links between optimism in different life domains and well-being have not been investigated. Studying investors' financial decision making and whether being financially optimistic has any advantages in terms of making better financial decisions and/or increasing one's well-being is a contribution to the field.

5.2.3. Summary

The above sections reviewed the literature on whether it is beneficial to be optimistic as well as the determinants of objective and subjective well-being. The effect of optimism on the level of physical well being, risk taking behaviour, happiness and satisfaction has been studied in prior research, but there is no overall conclusion on whether it be beneficial to be optimistic because optimism has both pros and cons in one's physical as well mental welfare (Weinstein & Lyon, 1999; Gollier, 2005; Hey, 1984; Bénabou & Tirole, 2002). In particular, whether being financially optimistic leads to a better situation in one's finances has not been studied.

Among the studies on the determinants of objective well-being, literature shows income and

wealth are the mostly researched indicators of well-being. Demographic factors such as age, education level, gender, and ethnicity are highly correlated with objective well-being (Ben-Porath, 1967; Benzoni, Collin-Dufresne, & Goldstein, 2007). Demographic variables were selected for analysis in this chapter based on previous literature on how demographics affect objective well-being.

Previous findings suggest wealth or income could affect happiness but not without other contributing factors. The overall conclusion is that highly educated people who are healthy, financially secured, intrinsically religious and altruistic with their time tend to be happier and more satisfied on the average (Moghaddam, 2008). Besides, demographic variables are far from enough to explain happiness and satisfaction, and other subjective variables such as self-confidence and optimism may have larger influences and need to be used as independent variables in investigating subjective well-being (Cummins & Nistico, 2002). In my study, I include both objective and subjective indicators to estimate their effects on subjective well-being and I expect subjective variables have stronger effects on subjective well-being than demographics. I also include financial optimism as one of the subjective variables to measure its effect on subjective well-being.

5.3. Research Hypothesis

Previous research has found optimism has both beneficial and undesirable effects on individuals' well-being. Optimism enhances motivation and sustains courage to overcome difficulties when reaching goals, but on the other hand it could reduce one's awareness of risks and lead to harmful outcomes (Weinstein & Lyon, 1999; Gollier, 2005). Optimism could also cause some unfavourable effects on people's mentality (Gollier, 2005). There is no decisive conclusion regarding whether it is beneficial to be optimistic.

Many previous studies on optimism and its potential benefit are theoretical models without being tested using field data. There is no previous research which investigated the relationship between optimism and objective and subjective well-being in the same study by using large-scale survey data. In addition, whether being financially optimistic leads to a better status in one's finances or mental well-being has not been studied before.

As I found in the chapter 4, empirical evidence shows that optimism encourages investors to invest in risky assets and optimists have lower accumulated financial wealth levels and a higher average unemployment rate than people who are pessimistic or neutral towards their financial situation. However, it is unclear whether optimism is associated with poor financial performance. It is possible that optimistic people work harder and optimism helps them to maintain motivation, and at the same time the less financially privileged try to stay optimistic to sustain happiness and satisfaction. In this chapter, I hope to find empirical evidence on the relationship between financial optimism and well-being by analysing a large set of real world data in the BHPS. I developed the following research hypothesis.

Hypothesis: Financial optimism is correlated with individuals' subjective well-being and is beneficial to their future objective well-being.

5.4. Data and Methodology

This section first re-introduces the field data and definitions of financial optimism, followed by definitions of objective and subjective well-being. This section also presents regression models for analysis of financial optimism and objective and subjective well-being in this chapter.

5.4.1. Data

I investigate the relationship between financial optimism and well-being among the individuals in the UK sample by using the British Household Panel Survey (BHPS). The details of the BHPS have been introduced in Chapter 3 and descriptive statistics on the selected BHPS variables were also provided. I defined *Financial expectation*, *A priori optimism*, and *A posteriori optimism* as my measures for financial optimism using the BHPS data in section 3.3. I select subjective variables from the BHPS for my analysis in section 5.5 (the full list of the original BHPS questionnaires can be found in Appendix 7).

5.4.2. Definitions of Objective and Subjective Well-being

Based on the discussion of previous literature on what is objective well-being and what is subjective well-being in section 5.2.2, I define objective well-being and subjective well-being using the available BHPS variables as follows. Financial wealth and total wealth was previously defined in section 4.4.2.

Objective Well-being

- Current income:

  INC0 = Current income (Variable definition 10)

- Change in income in 1 year:

  INC1 = Income in 1 year - current income (Variable definition 11)

- Change in income in 5 years:

  INC5 = Income in 5 years - current income (Variable definition 12)

- Change in income in 10 years:

  INC10 = Income in 10 years - current income (Variable definition 13)

- Current financial wealth:

  FW0 = Current financial wealth (Variable definition 14)

- Change in financial wealth in 5 years:

  FW5 = Financial wealth in 5 years - Current financial wealth (Variable definition 15)

- Change in financial wealth in 10 years:

  FW10 = Financial wealth in 10 years - Current financial wealth

  (Variable definition 16)

- Current total wealth:

  TW0 = Current total wealth (Variable definition 17)

- Change in total wealth in 5 years:

  TW5 = Total wealth in 5 years - Current total wealth (Variable definition 18)

- Change in total wealth in 10 years:

  TW10 = Total wealth in 10 years - Current total wealth (Variable definition 19)

Income here is categorised into four types of income as the dependent variables in the regression analysis. They are overall annual income, investment income, labour income and benefits income.

Subjective Well-being

- Current happiness:

  HAP0 = Current happiness (Variable definition 20)

- Change in happiness in 1 year:

  HAP1 = Happiness in 1 year - current happiness (Variable definition 21)

- Change in happiness in 5 years:

  HAP5 = Happiness in 5 years - current happiness (Variable definition 22)

- Change in happiness in 10 years:

  HAP10 = Happiness in 10 years - current happiness (Variable definition 23)

- Current satisfaction with life:

  SAT0 = Current satisfaction (Variable definition 24)

- Change in satisfaction in 1 year:

  SAT1 = Satisfaction in 1 year - current satisfaction (Variable definition 25)

- Change in satisfaction in 5 years:

  SAT5 = Satisfaction in 5 years - current satisfaction (Variable definition 26)

5.4.3. Methodology

This section introduces the methodology that is used in analysis in this chapter. I provide a general model as well as regression equations that will be used for regression analysis in section 5.5.

5.4.3.1. General Model

Literature discussed in section 5.2.1 illustrates positive and negative effects of optimism and how it could affect one's psychological and mental status and even career. Literature in section 5.2.2 shows that a number of demographics, such as age, gender, education and race affect one's objective well-being. In studies on subjective well-being, psychological variables together with demographics affect mental welfare. My aim in this chapter is to examine whether financial optimism also affects well-being as there is no previous research which studied financial

optimism and both objective and subjective well-being in the same cohesive work. The general model for financial optimism and well-being can be expressed as follows.

$$Well\ being_{p,t} = f(Optimism_{p,t}) + f(Demographics_{p,t}) \quad \text{Equation 14}$$

Where $Well\ being_{p,t}$ denotes the objective well-being or subjective well-being of individual investor p in year t, $f(Optimism_{p,t})$ represents the function of the effect of financial optimism on well-being of individual p in year t, $f(Demographics_{p,t})$ stands for the effect of demographic variables on the well-being on individual p in year t.

The functions of optimism and demographics are assumed to be linear relationships and OLS method is used to estimate parameters. Details of the OLS approach was explained in section 4.4.4.

5.4.3.2. Regression Models

The following regression models are developed to test whether financial optimism affects one's objective and subjective well-being. The definitions of well-being explained in section 5.4.2 are used as dependent variables, while financial optimism and demographics are used as independent variables. *i* represents each observation in the panel. Details on how demographic variables are selected were discussed in section 5.2.2.

Objective Well-being:

$$INC_i = \beta_0(optimism_i) + \sum_{j=1}^{15} \beta_j\, Demographics_{i,j} + \epsilon_i \quad \text{Equation 15}$$

Where INC_i is replaced by INC_i0 (current level), INC_i1 (increase in 1 year), INC_i5 (increase in 5 years), and INC_i10 (increase in 10 years) respectively in the actual regression analysis in section 5.5.1. Demographic variables include Age, Male, Married, Ethnicity, Health status, Business ownership, Finance related occupation, Contract type, Firm size, Unemployment, Unemployment a year ago, Educational level, Year of interview, Total savings and Total investment.

$$FW_i = \beta_0(optimism_i) + \sum_{j=1}^{16} \beta_j \, Demographics_{i,j} \, + \epsilon_i \qquad \text{Equation 16}$$

Where FW_i is replaced by FW_i0, FW_i5, and FW_i10 respectively in the actual regression analysis in section 5.5.1. Demographic variables include Age, Male, Married, Ethnicity, Health status, Household size, Annual household income, Home ownership, Business ownership, Finance related occupation, Contract type, Firm size, Unemployment, Unemployment a year ago, Educational level and Year of interview.

$$TW_i = \beta_0(optimism_i) + \sum_{j=1}^{15} \beta_j \, Demographics_{i,j} \, + \epsilon_i \qquad \text{Equation 17}$$

Where TW_i is replaced by TW_i0, TW_i5, and TW_i10 respectively in the actual regression analysis in section 5.5.1. Demographic variables include Age, Male, Married, Ethnicity, Health status, Household size, Annual household income, Business ownership, Finance related occupation, Contract type, Firm size, Unemployment, Unemployment a year ago, Educational level and Year of interview.

Subjective Well-being:

$$HAP_i = \beta_0(optimism_i) + \sum_{j=1}^{20} \beta_j \, Demographics_{i,j} \; + \epsilon_i \qquad \text{Equation 18}$$

Where HAP_i is replaced by HAP_i0, HAP_i1, HAP_i5, and HAP_i10 respectively in the actual regression analysis in section 5.5.2. Demographic variables include Age, Male, Married, Ethnicity, Health status, Annual household income, Total financial wealth, Home ownership, Business ownership, Contract type, Unemployment, Educational level, Private medical care, Playing a useful role, Constantly under strain, Problem overcoming difficulties, Enjoy day-to-day activities, Depressed, Losing confidence and Less belief in self-worth.

$$SAT_i = \beta_0(optimism_i) + \sum_{j=1}^{20} \beta_j \, Demographics_{i,j} \; + \epsilon_i \qquad \text{Equation 19}$$

Where SAT_i is replaced by SAT_i0, SAT_i1, and SAT_i5 respectively in the actual regression analysis in section 5.5.2. Demographic variables include Age, Male, Married, Ethnicity, Health status, Annual household income, Total financial wealth, Home ownership, Business ownership, Contract type, Unemployment, Educational level, Private medical care, Playing a useful role, Constantly under strain, Problem overcoming difficulties, Enjoy day-to-day activities, Depressed, Losing confidence and Less belief in self-worth.

5.5. Analysis and Findings:

This section conducts regression analysis using the regression equations introduced in section 5.4.3. Section 5.5.1 displays estimating coefficients which stand for the influences of financial optimism and demographic variables on objective well-being. Objective well-being is represented by different categories of income, financial wealth, and total wealth. Section 5.5.2 illustrates how financial optimism and demographics affect one's subjective well-being. Subjective well-being refers to general happiness and satisfaction with life in this study. Section 5.5.3 summarises main findings and implications of section 5.5.

5.5.1. Financial Optimism and Objective Well-being

Income, financial wealth, and total wealth are used to represent objective well-being in my analysis in this section. I use *Financial expectation*, *A priori optimism*, and *A posteriori optimism* as measures of financial optimism, and the relationships between objective well-being and each measure of optimism are reported in the following tables. Section 5.5.1.1 examines how optimism affects individuals' income level. Section 5.5.1.2 investigates the correlations between optimism and financial wealth. Section 5.5.1.3 looks into the correlation between optimism and one's total wealth. Findings on the relationships between optimism and objective well-being from the following tables are summarised in section 5.5.1.4.

5.5.1.1. Financial Optimism and Income

Income variables are used as dependent variables in my analysis. Besides overall income, I divided income into three sub-categories, namely investment income, labour income, and benefits income. I look at the influence of different measures of financial optimism on current

income as well as income changes in future. Details of the definitions of income are explained in section 5.4.2.

Table 32 Financial expectation and current income

This table reports the regression results for Equation 15 using *INC0* as the dependent variable. *Financial expectation* is used as the measure of financial optimism. Variables listed in the left column including optimism and demographics are independent variables for this regression. The level of current income, investment income, labour income and benefit income in the second row are the dependent variables estimated respectively in the regression analysis. Beta coefficients and the *p*-values associated with each coefficient are reported in the rest of the columns for all four types of income.

	Income							
	Income		**Investment Income**		**Labour Income**		**Benefit Income**	
	Beta	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**
Optimism: Financial Expectation	-0.003	0.195	0.019	0.061	-0.003	0.187	-0.005	0.357
Age	0.215	0.000	0.214	0.000	0.116	0.000	0.149	0.000
Male	0.228	0.000	0.035	0.000	0.274	0.000	-0.192	0.000
Married	0.106	0.000	-0.012	0.271	0.115	0.000	-0.142	0.000
White	0.004	0.094	-0.004	0.697	0.003	0.256	-0.003	0.534
Healthy	0.010	0.000	0.009	0.375	0.015	0.000	-0.034	0.000
Business ownership	-0.014	0.000	0.015	0.125	-0.013	0.000	-0.013	0.011
Finance related occupation	0.085	0.000	0.032	0.001	0.086	0.000	-0.043	0.000
Employment: permanent contract	0.188	0.000	-0.015	0.127	0.203	0.000	-0.046	0.000
Firm size	0.168	0.000	-0.016	0.119	0.198	0.000	-0.077	0.000
Unemployed	0.014	0.000	0.014	0.181	0.013	0.000	0.003	0.509
Unemployed a year ago	-0.084	0.000	0.010	0.323	-0.113	0.000	0.040	0.000
Education: first degree or above	0.237	0.000	0.065	0.000	0.236	0.000	-0.077	0.000
Date of interview: year	0.156	0.000	0.059	0.000	0.146	0.000	0.292	0.000
Total savings (ln)			0.099	0.000				
Total investment (ln)			0.185	0.000				
R Square	0.368		0.139		0.372		0.165	

Table 32 shows how *Financial expectation* is related to one's current income. *Financial expectation* measures a general outlook of one's financial situation in the next year. When investors have higher investment income, they are more likely to have positive financial expectations for the next year. Age, being male, being married, having permanent employment contract, working for larger firms and having higher education level are positively associated with overall income and labour income. Being healthy or working in the financial industry also increases income. The later the interview was taken place the higher the income, which reflects a significant rise in income over the years. If an individual was unemployed a year ago, her labour income is significant lower while her benefit income is higher than others. But just being

unemployed does not decrease income for the current year, perhaps there is a time lag between the effects of unemployment and one's financial situation. Total savings and investment, which were measured every five years, are positively correlated with investment income.

Table 33 A priori optimism and current income

This table reports the regression results for Equation 15 using *INC0* as the dependent variable. *A priori optimism* is used as the measure of financial optimism. Variables listed in the left column including optimism and demographics are independent variables for this regression. The level of current income, investment income, labour income and benefit income in the second row are the dependent variables estimated respectively in the regression analysis. Beta coefficients and the *p*-values associated with each coefficient are reported in the rest of the columns for all four types of income.

	Income							
	Income		**Investment Income**		**Labour Income**		**Benefit Income**	
	Beta	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**
Optimism: A Priori Optimism	0.013	0.000	-0.014	0.169	0.007	0.004	-0.016	0.001
Age	0.216	0.000	0.211	0.000	0.117	0.000	0.149	0.000
Male	0.227	0.000	0.036	0.000	0.274	0.000	-0.192	0.000
Married	0.106	0.000	-0.011	0.285	0.115	0.000	-0.142	0.000
White	0.004	0.079	-0.004	0.669	0.003	0.236	-0.003	0.526
Healthy	0.010	0.000	0.009	0.386	0.015	0.000	-0.035	0.000
Business ownership	-0.014	0.000	0.015	0.119	-0.013	0.000	-0.013	0.011
Finance related occupation	0.085	0.000	0.032	0.001	0.086	0.000	-0.042	0.000
Employment: permanent contract	0.188	0.000	-0.014	0.166	0.203	0.000	-0.047	0.000
Firm size	0.168	0.000	-0.015	0.120	0.198	0.000	-0.077	0.000
Unemployed	0.013	0.000	0.014	0.154	0.013	0.000	0.004	0.466
Unemployed a year ago	-0.083	0.000	0.010	0.332	-0.112	0.000	0.039	0.000
Education: first degree or above	0.237	0.000	0.066	0.000	0.236	0.000	-0.077	0.000
Date of interview: year	0.156	0.000	0.059	0.000	0.145	0.000	0.292	0.000
Total savings (ln)			0.097	0.000				
Total investment (ln)			0.185	0.000				
R Square	0.369		0.139		0.372		0.166	

Table 33 shows that *A priori optimism*, which measures one's financial optimism level before the information of the next year is exposed, is significantly correlated with current overall income, labour income and benefit income. More specifically, optimists are more likely to have higher overall income and labour income, but lower benefit income. However, *A priori optimism* does not seem to have a significant correlation with investment income and investment income is highly correlated with the amount of savings and investment individuals have. Being older, male, married, or healthy has a positive impact on income. As for employment status, individuals who are self employed or were unemployed a year ago have

lower income. On the other hand, individuals working in finance sector, having a permanent contract, working in larger firms or who are highly educated are more likely to earn higher salaries. The more recently the respondents are interviewed, the higher the labour and benefit income they get on average. Among all variables, age, gender and education have the largest influence on income.

Table 34 A posteriori optimism and current income

This table reports the regression results for Equation 15 using *INC0* as the dependent variable. *A posteriori optimism* is used as the measure of financial optimism. Variables listed in the left column including optimism and demographics are independent variables for this regression. The level of current income, investment income, labour income and benefit income in the second row are the dependent variables estimated respectively in the regression analysis. Beta coefficients and the *p*-values associated with each coefficient are reported in the rest of the columns for all four types of income.

	Income							
	Income		**Investment Income**		**Labour Income**		**Benefit Income**	
	Beta	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**
Optimism: A Posteriori Optimism	0.002	0.442	-0.017	0.100	-0.004	0.178	0.006	0.249
Age	0.209	0.000	0.215	0.000	0.109	0.000	0.145	0.000
Male	0.236	0.000	0.036	0.000	0.282	0.000	-0.190	0.000
Married	0.102	0.000	-0.009	0.394	0.111	0.000	-0.145	0.000
White	0.001	0.693	-0.001	0.956	0.000	0.877	0.000	0.999
Healthy	0.010	0.000	0.010	0.304	0.017	0.000	-0.032	0.000
Business ownership	-0.014	0.000	0.017	0.088	-0.012	0.000	-0.015	0.006
Finance related occupation	0.087	0.000	0.032	0.002	0.088	0.000	-0.043	0.000
Employment: permanent contract	0.190	0.000	-0.018	0.082	0.206	0.000	-0.050	0.000
Firm size	0.172	0.000	-0.014	0.177	0.202	0.000	-0.076	0.000
Unemployed	0.014	0.000	0.015	0.150	0.013	0.000	0.002	0.762
Unemployed a year ago	-0.081	0.000	0.009	0.385	-0.111	0.000	0.039	0.000
Education: first degree or above	0.241	0.000	0.062	0.000	0.237	0.000	-0.074	0.000
Date of interview: year	0.157	0.000	0.056	0.000	0.150	0.000	0.284	0.000
Total savings (ln)			0.093	0.000				
Total investment (ln)			0.188	0.000				
R Square	0.370		0.139		0.378		0.159	

I found in Table 34 that *A posteriori optimism*, which measures an individual's forecasting error, does not seem to be significantly correlated with any type of income. Again, some demographics such as age, gender, educational level, etc. are significantly correlated with one's income.

Table 35 Financial expectation and change in income in 1 year

This table reports the regression results for Equation 15 using *INC1* as the dependent variable. *Financial expectation* is used as the measure of financial optimism. Variables listed in the left column including optimism and demographics are independent variables for this regression. The increase of income in 1 year, including increase in general income, investment income, labour income and benefit income are the dependent variables estimated respectively in the regression analysis. Beta coefficients and the *p*-values associated with each coefficient are reported in the rest of the columns for all four types of income increase.

	Change in Income in 1 Year							
	Income		**Investment Income**		**Labour Income**		**Benefit Income**	
	Beta	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**
Optimism: Financial Expectation	0.048	0.000	0.004	0.585	0.057	0.000	-0.033	0.000
Age	-0.061	0.000	0.003	0.749	-0.064	0.000	0.023	0.000
Male	0.010	0.002	0.002	0.736	0.006	0.061	-0.054	0.000
Married	-0.012	0.000	-0.004	0.580	-0.011	0.002	0.019	0.000
White	0.010	0.002	0.001	0.868	0.007	0.031	0.008	0.015
Healthy	0.033	0.000	-0.008	0.273	0.039	0.000	-0.020	0.000
Business ownership	-0.008	0.015	-0.006	0.413	-0.006	0.056	-0.002	0.523
Finance related occupation	0.014	0.000	0.010	0.146	0.015	0.000	-0.002	0.572
Employment: permanent contract	0.030	0.000	-0.013	0.076	0.043	0.000	-0.006	0.072
Firm size	0.020	0.000	-0.008	0.239	0.025	0.000	-0.015	0.000
Unemployed	-0.023	0.000	-0.004	0.556	-0.027	0.000	0.024	0.000
Unemployed a year ago	0.049	0.000	0.002	0.742	0.052	0.000	-0.064	0.000
Education: first degree or above	0.049	0.000	0.008	0.293	0.055	0.000	-0.020	0.000
Date of interview: year	-0.014	0.000	-0.015	0.038	-0.023	0.000	-0.012	0.001
Total savings (ln)			-0.045	0.000				
Total investment (ln)			-0.009	0.269				
R Square	0.017		0.003		0.021		0.012	

Now I move on to see how financial optimism is related to income changes in 1 year's time. In Table 35, I found that having higher *Financial expectation* is related to a higher increase in one's overall and labour income in 1 year, but is correlated with a lower increase in benefit income. Getting older, being married, having business ownership and being unemployed also reduces the change in overall and labour income. On the other hand, being male, healthy, having permanent employment contract, working for larger firms or in financial industry or being more educated improves salary promotions.

Table 36 A priori optimism and change in income in 1 year

This table reports the regression results for Equation 15 using *INC1* as the dependent variable. *A priori optimism* is used as the measure of financial optimism. Variables listed in the left column including optimism and demographics are independent variables for this regression. The increase of income in 1 year, including increase in general income, investment income, labour income and benefit income are the dependent variables estimated respectively in the regression analysis. Beta coefficients and the *p*-values associated with each coefficient are reported in the rest of the columns for all four types of income increase.

	Change in Income in 1 Year							
	Income		**Investment Income**		**Labour Income**		**Benefit Income**	
	Beta	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**
Optimism: A Priori Optimism	-0.038	0.000	0.002	0.783	-0.036	0.000	-0.012	0.000
Age	-0.073	0.000	0.002	0.829	-0.078	0.000	0.031	0.000
Male	0.013	0.000	0.003	0.723	0.009	0.006	-0.055	0.000
Married	-0.011	0.002	-0.004	0.577	-0.010	0.007	0.019	0.000
White	0.010	0.003	0.001	0.869	0.007	0.043	0.008	0.016
Healthy	0.032	0.000	-0.008	0.278	0.038	0.000	-0.020	0.000
Business ownership	-0.007	0.027	-0.006	0.417	-0.005	0.101	-0.003	0.427
Finance related occupation	0.015	0.000	0.011	0.142	0.016	0.000	-0.002	0.459
Employment: permanent contract	0.033	0.000	-0.013	0.079	0.047	0.000	-0.008	0.024
Firm size	0.019	0.000	-0.008	0.239	0.024	0.000	-0.014	0.000
Unemployed	-0.022	0.000	-0.004	0.552	-0.025	0.000	0.024	0.000
Unemployed a year ago	0.050	0.000	0.003	0.727	0.054	0.000	-0.066	0.000
Education: first degree or above	0.051	0.000	0.008	0.284	0.056	0.000	-0.021	0.000
Date of interview: year	-0.012	0.001	-0.015	0.039	-0.020	0.000	-0.013	0.000
Total savings (ln)			-0.045	0.000				
Total investment (ln)			-0.009	0.267				
R Square	0.016		0.003		0.019		0.011	

Beta coefficients in Table 36 show that optimistic individuals have a lower increase in overall income, labour income and benefit income in one year's time than non-optimists. This result is based on the *A priori optimism* measure which includes a benchmark component compared to the *Financial expectation* measure. Older or married individuals have reduced change in labour income but an increased change in benefit income for the following year. Males or healthy respondents have a higher increase in labour income but lower change in benefit income in one year's time. Firm size has similar effect as health status on one's income change. Individuals who are unemployed a year ago are more likely have an increase in labour income and a decrease in benefit income, perhaps this is due to their changes in employment status during the current year. The level of annual increase in income reduces across all waves. Having higher savings last year lowers investment income in the following year.

Table 37 A posteriori optimism and change in income in 1 year

This table reports the regression results for Equation 15 using *INC1* as the dependent variable. *A posteriori optimism* is used as the measure of financial optimism. Variables listed in the left column including optimism and demographics are independent variables for this regression. The increase of income in 1 year, including increase in general income, investment income, labour income and benefit income are the dependent variables estimated respectively in the regression analysis. Beta coefficients and the *p*-values associated with each coefficient are reported in the rest of the columns for all four types of income increase.

	Change in Income in 1 Year							
	Income		**Investment Income**		**Labour Income**		**Benefit Income**	
	Beta	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**
Optimism: A Posteriori Optimism	-0.066	0.000	-0.038	0.000	-0.070	0.000	0.022	0.000
Age	-0.075	0.000	0.000	0.958	-0.081	0.000	0.032	0.000
Male	0.013	0.000	0.003	0.694	0.009	0.006	-0.055	0.000
Married	-0.012	0.001	-0.004	0.629	-0.010	0.005	0.019	0.000
White	0.010	0.004	0.001	0.922	0.006	0.052	0.008	0.012
Healthy	0.031	0.000	-0.009	0.219	0.037	0.000	-0.019	0.000
Business ownership	-0.007	0.023	-0.005	0.459	-0.006	0.090	-0.003	0.437
Finance related occupation	0.015	0.000	0.010	0.144	0.016	0.000	-0.002	0.470
Employment: permanent contract	0.035	0.000	-0.011	0.120	0.049	0.000	-0.008	0.012
Firm size	0.019	0.000	-0.009	0.227	0.024	0.000	-0.014	0.000
Unemployed	-0.023	0.000	-0.004	0.618	-0.026	0.000	0.024	0.000
Unemployed a year ago	0.052	0.000	0.003	0.634	0.056	0.000	-0.066	0.000
Education: first degree or above	0.050	0.000	0.007	0.322	0.056	0.000	-0.021	0.000
Date of interview: year	-0.012	0.000	-0.014	0.057	-0.020	0.000	-0.013	0.000
Total savings (ln)			-0.047	0.000				
Total investment (ln)			-0.009	0.254				
R Square	0.019		0.005		0.023		0.012	

In Table 37, *A posteriori optimism* reduces future income increase regarding overall, investment, and labour income, but it increases changes in benefit income. As one would imagine people who are on benefits might have lost their jobs or are going through some financial hardships. The *A posteriori optimism* measures one's forecasting errors and reflects the low outcome realisation in one's financial situation. I found consistent results on relationships between demographics and change in income in 1 year with that in Table 35 and Table 36.

Table 38 Financial expectation and change in income in 5 years

This table reports the regression results for Equation 15 using *INC5* as the dependent variable. *Financial expectation* is used as the measure of financial optimism. Variables listed in the left column including optimism and demographics are independent variables for this regression. The increase of income in 5 years, including increase in general income, investment income, labour income and benefit income are the dependent variables estimated respectively in the regression analysis. Beta coefficients and the *p*-values associated with each coefficient are reported in the rest of the columns for all four types of income increase.

	Change in Income in 5 Years							
	Income		**Investment Income**		**Labour Income**		**Benefit Income**	
	Beta	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**
Optimism: Financial Expectation	0.052	0.000	0.008	0.570	0.048	0.000	-0.031	0.000
Age	-0.198	0.000	0.073	0.000	-0.258	0.000	0.066	0.000
Male	0.047	0.000	0.001	0.936	0.047	0.000	-0.069	0.000
Married	-0.005	0.387	-0.001	0.969	0.000	0.954	0.028	0.000
White	-0.005	0.431	-0.002	0.867	-0.012	0.034	0.004	0.481
Healthy	0.040	0.000	0.016	0.278	0.047	0.000	-0.021	0.001
Business ownership	0.012	0.046	0.004	0.775	0.006	0.288	-0.003	0.575
Finance related occupation	-0.012	0.050	0.029	0.046	-0.012	0.032	0.010	0.083
Employment: permanent contract	-0.016	0.007	0.005	0.740	-0.002	0.785	-0.010	0.089
Firm size	0.006	0.315	0.003	0.821	0.008	0.196	0.018	0.003
Unemployed	-0.011	0.077	0.022	0.147	-0.007	0.209	0.003	0.666
Unemployed a year ago	0.025	0.000	-0.028	0.065	0.017	0.005	-0.047	0.000
Education: first degree or above	0.041	0.000	0.043	0.004	0.051	0.000	-0.038	0.000
Date of interview: year	0.004	0.502	-0.016	0.275	0.002	0.725	0.009	0.157
Total savings (ln)			-0.038	0.016				
Total investment (ln)			0.011	0.499				
R Square	0.056		0.009		0.085		0.019	

Table 38 shows in 5 years' time, financially optimistic individuals have a larger increase in their overall income and labour income but have a lower increase in benefit income. Being older reduces changes in income in 5 years' time. Although some of the demographic variables such as being healthy or highly educated still have positive effects on income increase over time most of the other variables, such as having a permanent contract or working for larger firms, seem to have lost their power in improving labour income.

Table 39 A priori optimism and change in income in 5 years

This table reports the regression results for Equation 15 using *INC5* as the dependent variable. *A priori optimism* is used as the measure of financial optimism. Variables listed in the left column including optimism and demographics are independent variables for this regression. The increase of income in 5 years, including increase in general income, investment income, labour income and benefit income are the dependent variables estimated respectively in the regression analysis. Beta coefficients and the *p*-values associated with each coefficient are reported in the rest of the columns for all four types of income increase.

	Change in Income in 5 Years							
	Income		**Investment Income**		**Labour Income**		**Benefit Income**	
	Beta	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**
Optimism: A Priori Optimism	0.031	0.000	-0.006	0.683	0.029	0.000	-0.019	0.001
Age	-0.208	0.000	0.071	0.000	-0.267	0.000	0.072	0.000
Male	0.048	0.000	0.002	0.901	0.048	0.000	-0.069	0.000
Married	-0.005	0.392	0.000	0.976	0.000	0.960	0.028	0.000
White	-0.005	0.415	-0.003	0.855	-0.012	0.032	0.004	0.473
Healthy	0.042	0.000	0.016	0.276	0.049	0.000	-0.022	0.000
Business ownership	0.013	0.034	0.004	0.767	0.007	0.239	-0.004	0.527
Finance related occupation	-0.010	0.082	0.029	0.042	-0.011	0.053	0.010	0.108
Employment: permanent contract	-0.015	0.011	0.005	0.726	-0.001	0.900	-0.011	0.073
Firm size	0.006	0.325	0.003	0.827	0.008	0.203	0.018	0.003
Unemployed	-0.011	0.059	0.022	0.144	-0.008	0.171	0.003	0.614
Unemployed a year ago	0.028	0.000	-0.028	0.063	0.019	0.001	-0.048	0.000
Education: first degree or above	0.042	0.000	0.043	0.004	0.052	0.000	-0.039	0.000
Date of interview: year	0.008	0.168	-0.016	0.286	0.006	0.310	0.006	0.312
Total savings (ln)			-0.039	0.015				
Total investment (ln)			0.011	0.502				
R Square	0.054		0.009		0.083		0.018	

I found in Table 39 that optimists have increased changes in overall and labour income, and reduced changes in benefit income in five years' time. Compared to the mixed findings in financial optimism and income changes in 1 year, findings here among different measures of optimism (*Financial expectation* and *A priori optimism*) are more consistent. It seems that being financial optimistic does have more certain benefits in terms of increased changes in income in the longer term. Optimists might not be able to predict their changes in financial situation correctly for the next year, but given a longer period of time, optimists become better off financially in terms of increase in income than non-optimists. Old age contributes to less to labour income and more to benefit income in the future. Being male, healthy or highly educated is related to an increase in labour income but a decrease in benefit income.

Table 40 A posteriori optimism and change in income in 5 years

This table reports the regression results for Equation 15 using *INC5* as the dependent variable. *A posteriori optimism* is used as the measure of financial optimism. Variables listed in the left column including optimism and demographics are independent variables for this regression. The increase of income in 5 years, including increase in general income, investment income, labour income and benefit income are the dependent variables estimated respectively in the regression analysis. Beta coefficients and the *p*-values associated with each coefficient are reported in the rest of the columns for all four types of income increase.

	Change in Income in 5 Years							
	Income		**Investment Income**		**Labour Income**		**Benefit Income**	
	Beta	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**
Optimism: A Posteriori Optimism	-0.038	0.000	-0.031	0.032	-0.042	0.000	0.013	0.031
Age	-0.211	0.000	0.070	0.000	-0.270	0.000	0.073	0.000
Male	0.049	0.000	0.002	0.881	0.049	0.000	-0.070	0.000
Married	-0.005	0.424	0.000	0.982	0.000	0.993	0.028	0.000
White	-0.006	0.297	-0.003	0.813	-0.014	0.017	0.005	0.414
Healthy	0.039	0.000	0.015	0.288	0.046	0.000	-0.021	0.001
Business ownership	0.012	0.041	0.004	0.756	0.006	0.275	-0.004	0.547
Finance related occupation	-0.010	0.079	0.029	0.043	-0.011	0.051	0.010	0.106
Employment: permanent contract	-0.015	0.012	0.006	0.700	-0.001	0.919	-0.011	0.074
Firm size	0.004	0.467	0.003	0.849	0.006	0.311	0.019	0.002
Unemployed	-0.010	0.080	0.022	0.141	-0.007	0.216	0.003	0.668
Unemployed a year ago	0.028	0.000	-0.027	0.069	0.019	0.001	-0.048	0.000
Education: first degree or above	0.039	0.000	0.041	0.005	0.050	0.000	-0.038	0.000
Date of interview: year	0.008	0.214	-0.015	0.303	0.005	0.388	0.007	0.288
Total savings (ln)			-0.039	0.013				
Total investment (ln)			0.011	0.502				
R Square	0.054		0.009		0.084		0.018	

Table 40 shows *A posteriori optimism* reduces future overall, investment and labour income increase but increases benefit income. This result appears to contradict the implications I found in Table 38 and Table 39, but as I discussed in the interpretation for Table 37 that *A posteriori optimism* reflects individuals' high expectation but low realisation in financial gains. People who have a high *A posteriori optimism* score are often the ones who get less actual financial income. This seems to be the underlying reasons of my findings here. Among demographic variables, health and education levels are still significant factors to improving future income.

Table 41 Financial expectation and change in income in 10 years

This table reports the regression results for Equation 15 using *INC10* as the dependent variable. *Financial expectation* is used as the measure of financial optimism. Variables listed in the left column including optimism and demographics are independent variables for this regression. The increase of income in 10 years, including increase in general income, investment income, labour income and benefit income are the dependent variables estimated respectively in the regression analysis. Beta coefficients and the *p*-values associated with each coefficient are reported in the rest of the columns for all four types of income increase.

	Change in Income in 10 Years							
	Income		**Investment Income**		**Labour Income**		**Benefit Income**	
	Beta	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**
Optimism: Financial Expectation	0.031	0.000	0.025	0.221	0.020	0.004	-0.023	0.003
Age	-0.287	0.000	0.083	0.000	-0.418	0.000	0.159	0.000
Male	0.058	0.000	-0.006	0.777	0.069	0.000	-0.055	0.000
Married	0.000	0.958	-0.001	0.955	0.028	0.000	-0.040	0.000
White	-0.011	0.108	0.012	0.542	-0.016	0.016	0.017	0.022
Healthy	0.035	0.000	0.001	0.972	0.047	0.000	-0.022	0.003
Business ownership	0.013	0.067	-0.004	0.840	0.006	0.357	-0.016	0.033
Finance related occupation	-0.036	0.000	0.059	0.003	-0.036	0.000	0.015	0.041
Employment: permanent contract	-0.031	0.000	-0.002	0.930	-0.015	0.027	0.010	0.192
Firm size	-0.047	0.000	0.022	0.279	-0.030	0.000	0.042	0.000
Unemployed	-0.017	0.020	-0.002	0.911	-0.014	0.038	0.002	0.739
Unemployed a year ago	0.023	0.001	-0.025	0.223	0.009	0.199	-0.034	0.000
Education: first degree or above	0.028	0.000	0.030	0.136	0.047	0.000	-0.041	0.000
Date of interview: year	-0.003	0.693			0.001	0.836	0.002	0.783
Total savings (ln)			-0.094	0.000				
Total investment (ln)			0.072	0.001				
R Square	0.098		0.020		0.186		0.035	

When I investigate whether financial optimism affects income in 10 years' time, I found in Table 41 that *Financial expectation* improves income changes in the future. Being male, healthy or highly educated still holds strong in the increase in income even in 10 years' time. Other variables which are positively correlated with current income, such as working in a finance related field, having a permanent employment contract or working in larger firms have a negative relationship with the increase in income in 10 years' time. This might imply jobs in such working environments provide stable income but the income increase in the long term is not significantly high.

Table 42 A priori optimism and change in income in 10 years

This table reports the regression results for Equation 15 using *INC10* as the dependent variable. *A priori optimism* is used as the measure of financial optimism. Variables listed in the left column including optimism and demographics are independent variables for this regression. The increase of income in 10 years, including increase in general income, investment income, labour income and benefit income are the dependent variables estimated respectively in the regression analysis. Beta coefficients and the *p*-values associated with each coefficient are reported in the rest of the columns for all four types of income increase.

	Change in Income in 10 Years							
	Income		**Investment Income**		**Labour Income**		**Benefit Income**	
	Beta	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**
Optimism: A Priori Optimism	0.035	0.000	-0.025	0.213	0.027	0.000	-0.017	0.019
Age	-0.293	0.000	0.077	0.000	-0.422	0.000	0.164	0.000
Male	0.058	0.000	-0.004	0.846	0.069	0.000	-0.055	0.000
Married	0.000	0.963	0.001	0.975	0.027	0.000	-0.040	0.000
White	-0.011	0.117	0.011	0.567	-0.016	0.017	0.017	0.023
Healthy	0.037	0.000	0.001	0.973	0.048	0.000	-0.022	0.002
Business ownership	0.013	0.060	-0.003	0.863	0.006	0.341	-0.016	0.030
Finance related occupation	-0.036	0.000	0.062	0.002	-0.036	0.000	0.015	0.048
Employment: permanent contract	-0.031	0.000	-0.001	0.972	-0.015	0.031	0.009	0.209
Firm size	-0.046	0.000	0.021	0.286	-0.030	0.000	0.041	0.000
Unemployed	-0.018	0.014	-0.001	0.958	-0.015	0.029	0.003	0.686
Unemployed a year ago	0.026	0.000	-0.027	0.199	0.011	0.126	-0.035	0.000
Education: first degree or above	0.030	0.000	0.030	0.141	0.048	0.000	-0.042	0.000
Date of interview: year	-0.001	0.900			0.003	0.695	0.001	0.928
Total savings (ln)			-0.098	0.000				
Total investment (ln)			0.071	0.002				
R Square	0.099		0.020		0.186		0.035	

When I look 10 years ahead in Table 42, *A priori optimism* is positively correlated with the increase in the change in overall income and labour income and it reduces change in benefit income. The results are very similar to what I found in Table 41, which suggests the positive influence of being financially optimistic may not appear immediately but the effect becomes prominent after a longer period of time. The channel through which financial optimism benefits individuals' future income is uncertain given the limited relevant information that is revealed in the BHPS, but it is possible that optimists achieve better financial situation through stronger motivation and perseverance in pursuing success as suggested in previous literature (Weinstein & Lyon, 1999; Bénabou & Tirole, 2002). The older population has a lower increase in labour income but a higher increase in benefit income. Unemployment has a long-term impact on decreasing income.

Table 43 A posteriori optimism and change in income in 10 years

This table reports the regression results for Equation 15 using *INC10* as the dependent variable. *A posteriori optimism* is used as the measure of financial optimism. Variables listed in the left column including optimism and demographics are independent variables for this regression. The increase of income in 10 years, including increase in general income, investment income, labour income and benefit income are the dependent variables estimated respectively in the regression analysis. Beta coefficients and the *p*-values associated with each coefficient are reported in the rest of the columns for all four types of income increase.

	Change in Income in 10 Years							
	Income		**Investment Income**		**Labour Income**		**Benefit Income**	
	Beta	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**
Optimism: A Posteriori Optimism	-0.002	0.832	-0.006	0.781	-0.013	0.052	0.023	0.002
Age	-0.294	0.000	0.077	0.000	-0.423	0.000	0.165	0.000
Male	0.058	0.000	-0.005	0.810	0.069	0.000	-0.056	0.000
Married	0.001	0.925	0.000	0.997	0.028	0.000	-0.040	0.000
White	-0.012	0.100	0.012	0.561	-0.017	0.013	0.018	0.018
Healthy	0.035	0.000	0.001	0.952	0.047	0.000	-0.021	0.004
Business ownership	0.014	0.056	-0.004	0.853	0.006	0.339	-0.016	0.031
Finance related occupation	-0.036	0.000	0.061	0.002	-0.036	0.000	0.015	0.049
Employment: permanent contract	-0.031	0.000	-0.001	0.956	-0.015	0.031	0.009	0.214
Firm size	-0.048	0.000	0.021	0.288	-0.031	0.000	0.042	0.000
Unemployed	-0.017	0.019	-0.002	0.911	-0.014	0.039	0.002	0.754
Unemployed a year ago	0.025	0.001	-0.025	0.229	0.010	0.152	-0.035	0.000
Education: first degree or above	0.028	0.000	0.030	0.141	0.046	0.000	-0.040	0.000
Date of interview: year	-0.001	0.876			0.002	0.761	0.002	0.832
Total savings (ln)			-0.095	0.000				
Total investment (ln)			0.071	0.002				
R Square	0.097		0.020		0.186		0.035	

Similar to what I found in the relationship between *A posteriori optimism* and the increase in income in 5 years, Table 43 shows *A posteriori optimism* has a negative correlation with labour income but a positive relationship with benefit income. The implications of such findings were discussed in the analysis of results from Table 40.

5.5.1.2. Financial Optimism and Financial Wealth

Table 44 to Table 46 shows the relationships between financial optimism and individuals' financial wealth. The three measures of financial optimism are used as independent variables respectively in the following tables. Current financial wealth level and future increase in wealth in 5 and 10 years' time are used as the dependent variables.

Table 44 Financial expectation and financial wealth

This table reports the regression results for Equation 16 using *FW0*, *FW5* and *FW10* as the dependent variable. *Financial expectation* is used as the measure of financial optimism. Variables listed in the left column including optimism and demographics are independent variables for this regression. The current level of financial wealth and increase in financial wealth in 5 and 10 years listed in the second row are the dependent variables estimated respectively in the regression analysis. Beta coefficients and the *p*-values associated with each coefficient are reported in the rest of the columns.

	Financial Wealth					
	Financial Wealth		**Change in 5 Years**		**Change in 10 Years**	
	Beta	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**
Optimism: Financial Expectation	-0.077	0.000	0.028	0.006	0.046	0.009
Age	0.275	0.000	0.005	0.669	0.024	0.205
Male	0.052	0.000	-0.012	0.240	-0.006	0.744
Married	-0.008	0.332	-0.024	0.035	-0.034	0.076
White	-0.017	0.025	-0.004	0.719	-0.007	0.672
Healthy	0.034	0.000	0.002	0.823	-0.014	0.431
Household size	-0.148	0.000	-0.039	0.000	-0.005	0.784
Annual household income (ln)	0.197	0.000	0.006	0.597	0.001	0.961
Home ownership	0.099	0.000	0.026	0.017	0.050	0.007
Business ownership	-0.008	0.314	-0.003	0.784	-0.006	0.732
Finance related occupation	0.072	0.000	0.005	0.627	0.017	0.335
Employment: permanent contract	-0.015	0.053	0.001	0.905	0.004	0.833
Firm size	0.026	0.001	-0.001	0.947	0.005	0.770
Unemployed	0.009	0.265	-0.014	0.173	-0.003	0.872
Unemployed a year ago	-0.026	0.001	-0.006	0.593	-0.002	0.903
Education: first degree or above	0.102	0.000	0.025	0.018	0.027	0.131
Date of interview: year	-0.030	0.000	-0.055	0.000		
R Square	0.222		0.007		0.007	

Table 44 shows that people who have higher *Financial expectation* for the next year have less current financial wealth compared to people who have lower *Financial expectation*. But in 5 and 10 years, their increase in financial wealth will be more than less optimistic people. The implications of the estimating results in this table are consistent with what I found in the relationship between financial optimism and income. However, it is not clear whether optimism benefits next year's financial wealth due to the limitation of my data as financial wealth is only measured every 5 years in the BHPS. Being older, male, working in finance related industry and being more educated indicate this individual has a higher level of current financial wealth. Having a large household is related to low financial wealth and this negative correlation even exists in the medium term (5 years).

Table 45 A Priori optimism and financial wealth

This table reports the regression results for Equation 16 using *FW0*, *FW5* and *FW10* as the dependent variable. *A priori optimism* is used as the measure of financial optimism. Variables listed in the left column including optimism and demographics are independent variables for this regression. The current level of financial wealth and increase in financial wealth in 5 and 10 years listed in the second row are the dependent variables estimated respectively in the regression analysis. Beta coefficients and the *p*-values associated with each coefficient are reported in the rest of the columns.

	Financial Wealth					
	Financial Wealth		**Change in 5 Years**		**Change in 10 Years**	
	Beta	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**
Optimism: A Priori Optimism	-0.091	0.000	0.018	0.081	0.019	0.272
Age	0.292	0.000	-0.001	0.918	0.014	0.451
Male	0.051	0.000	-0.012	0.261	-0.006	0.753
Married	-0.005	0.561	-0.024	0.034	-0.034	0.083
White	-0.017	0.030	-0.004	0.697	-0.007	0.678
Healthy	0.030	0.000	0.003	0.749	-0.013	0.461
Household size	-0.146	0.000	-0.040	0.000	-0.006	0.745
Annual household income (ln)	0.190	0.000	0.008	0.527	0.003	0.879
Home ownership	0.101	0.000	0.025	0.021	0.048	0.009
Business ownership	-0.008	0.284	-0.002	0.805	-0.006	0.739
Finance related occupation	0.070	0.000	0.006	0.564	0.018	0.289
Employment: permanent contract	-0.016	0.044	0.002	0.844	0.005	0.767
Firm size	0.027	0.001	-0.001	0.915	0.004	0.813
Unemployed	0.012	0.124	-0.015	0.148	-0.004	0.821
Unemployed a year ago	-0.030	0.000	-0.004	0.685	0.000	0.998
Education: first degree or above	0.100	0.000	0.026	0.015	0.027	0.128
Date of interview: year	-0.031	0.000	-0.053	0.000		
R Square	0.225		0.007		0.005	

Table 45 shows *A priori optimism* is negatively associated with a subject's financial wealth level in the current year, but in five years' time optimists have larger improvements financially. *A priori optimism* has a positive but non-significant relationship with one's wealth level in ten years' time. People who are financially optimistic have lower accumulated financial wealth than people who are neutral or pessimistic for the year they are being interviewed, but in the longer term (5 years in this case), optimists have a significant increase in the change in financial wealth. Similar to my findings on *Financial expectation* and financial wealth, results in this table do not necessarily mean optimists end up being richer than non-optimists, but suggest that being optimistic is beneficial in increasing an individual's own financial wealth regardless of how well off the individual was. Age, gender, health status, household income, occupation and firm size all significantly affect the increase in financial wealth in the near future but they barely have any significant effects on the increase in financial wealth in five or ten years' time. The

size of the household reduces one's financial wealth in both current time period and increase in five years' time while having home ownership and being highly educated both have a longer-term profound influence in increasing one's financial wealth.

Table 46 A posteriori optimism and financial wealth

This table reports the regression results for Equation 16 using *FW0*, *FW5* and *FW10* as the dependent variable. *A posteriori optimism* is used as the measure of financial optimism. Variables listed in the left column including optimism and demographics are independent variables for this regression. The current level of financial wealth and increase in financial wealth in 5 and 10 years listed in the second row are the dependent variables estimated respectively in the regression analysis. Beta coefficients and the *p*-values associated with each coefficient are reported in the rest of the columns.

	Financial Wealth					
	Financial Wealth		**Change in 5 Years**		**Change in 10 Years**	
	Beta	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**
Optimism: A Posteriori Optimism	-0.048	0.000	-0.026	0.012	-0.026	0.132
Age	0.292	0.000	-0.003	0.758	0.014	0.446
Male	0.049	0.000	-0.011	0.278	-0.005	0.764
Married	-0.008	0.388	-0.022	0.060	-0.031	0.110
White	-0.016	0.048	-0.004	0.678	-0.006	0.709
Healthy	0.034	0.000	0.002	0.874	-0.014	0.429
Household size	-0.150	0.000	-0.039	0.000	-0.007	0.729
Annual household income (ln)	0.205	0.000	0.007	0.535	-0.004	0.849
Home ownership	0.101	0.000	0.024	0.032	0.047	0.012
Business ownership	-0.008	0.294	-0.002	0.851	-0.006	0.717
Finance related occupation	0.069	0.000	0.006	0.587	0.019	0.283
Employment: permanent contract	-0.016	0.048	0.002	0.865	0.007	0.697
Firm size	0.023	0.006	0.000	0.970	0.003	0.862
Unemployed	0.010	0.247	-0.014	0.174	-0.003	0.869
Unemployed a year ago	-0.025	0.003	-0.005	0.658	0.000	0.991
Education: first degree or above	0.092	0.000	0.023	0.028	0.027	0.139
Date of interview: year	-0.028	0.001	-0.051	0.000		
R Square	0.221		0.007		0.005	

Similar to what I found with *A posteriori optimism* and future income, Table 46 shows having high expectation but low realisation means *A posteriori optimism* is negatively associated with financial wealth both in current status and longer term increase. Among demographics, having a large household still reduces one's increase in financial wealth significantly even in 5 years' time.

5.5.1.3. Financial Optimism and Total Wealth

Table 47 to Table 49 reports the estimating coefficients for the analysis between financial optimism and total wealth. I not only look at whether being financially optimistic is associated with current wealth levels but also whether it is beneficial to increase total wealth level in the future.

Table 47 Financial expectation and total wealth

This table reports the regression results for Equation 17 using *TW0*, *TW5* and *TW10* as the dependent variable. *Financial expectation* is used as the measure of financial optimism. Variables listed in the left column including optimism and demographics are independent variables for this regression. The current level of total wealth and increase in total wealth in 5 and 10 years listed in the second row are the dependent variables estimated respectively in the regression analysis. Beta coefficients and the *p*-values associated with each coefficient are reported in the rest of the columns.

	Total Wealth					
	Total Wealth		**Change in 5 Years**		**Change in 10 Years**	
	Beta	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**
Optimism: Financial Expectation	-0.053	0.000	-0.015	0.135	-0.005	0.775
Age	0.155	0.000	0.022	0.041	0.001	0.942
Male	0.009	0.182	-0.017	0.087	-0.003	0.841
Married	0.028	0.000	0.177	0.000	0.115	0.000
White	-0.017	0.012	-0.027	0.005	-0.029	0.090
Healthy	0.022	0.001	0.040	0.000	0.006	0.708
Household size	0.005	0.522	-0.089	0.000	-0.067	0.000
Annual household income (ln)	0.323	0.000	0.069	0.000	0.092	0.000
Business ownership	0.005	0.460	0.016	0.100	-0.003	0.849
Finance related occupation	0.038	0.000	0.031	0.001	0.018	0.278
Employment: permanent contract	-0.024	0.000	0.040	0.000	0.007	0.695
Firm size	0.010	0.119	0.040	0.000	0.048	0.005
Unemployed	0.006	0.345	-0.015	0.125	0.007	0.695
Unemployed a year ago	-0.029	0.000	-0.007	0.476	-0.016	0.375
Education: first degree or above	0.023	0.001	0.061	0.000	0.080	0.000
Date of interview: year	0.099	0.000	0.130	0.000		
R Square	0.185		0.088		0.045	

When I investigate the relationship between optimism and total wealth, I found in Table 47 that *Financial expectation* is not only related to low current total wealth, but also reduces changes in future total wealth in 5 years. This correlation becomes insignificant in a longer term (5-10 years) in future. Although I found in Table 44 that being optimistic helps to increase future financial wealth level, the results in this table remind me of the fact that optimists are on average worse off financially and have lower home ownership than non-optimists as found in

chapter 4. As home value is a large component of total wealth, optimistic individuals might not be able catch up with better off home owners in 5 to 10 years time even though optimists achieve larger increase in income and financial wealth in 5 years' time. The increase in house values is probably more dramatic than the increase in people's financial wealth (savings and investment). I also ran the regression only on home owners and found very similar results as in Table 47. This is likely due to optimists buying cheaper homes compared to non-opitmists on average (see details in section 4.5.1) and more expensivehomes are more likely to have a larger increase in their absolute values compared to increases in the values of cheaper homes. Being old, married, healthy, having higher household income or having higher levels of education all have a positive long-term impact on one's total wealth level.

Table 48 A priori optimism and total wealth

This table reports the regression results for Equation 17 using TW0, TW5 and TW10 as the dependent variable. *A priori optimism* is used as the measure of financial optimism. Variables listed in the left column including optimism and demographics are independent variables for this regression. The current level of total wealth and increase in total wealth in 5 and 10 years listed in the second row are the dependent variables estimated respectively in the regression analysis. Beta coefficients and the p-values associated with each coefficient are reported in the rest of the columns.

	Total Wealth					
	Total Wealth		**Change in 5 Years**		**Change in 10 Years**	
	Beta	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**
Optimism: A Priori Optimism	-0.023	0.001	-0.017	0.085	0.003	0.864
Age	0.166	0.000	0.026	0.017	0.003	0.890
Male	0.007	0.279	-0.017	0.087	-0.004	0.832
Married	0.028	0.000	0.177	0.000	0.114	0.000
White	-0.017	0.013	-0.027	0.006	-0.029	0.089
Healthy	0.021	0.001	0.040	0.000	0.006	0.707
Household size	0.006	0.434	-0.089	0.000	-0.067	0.000
Annual household income (ln)	0.322	0.000	0.068	0.000	0.093	0.000
Business ownership	0.004	0.510	0.016	0.104	-0.003	0.850
Finance related occupation	0.036	0.000	0.031	0.002	0.018	0.288
Employment: permanent contract	-0.026	0.000	0.040	0.000	0.006	0.712
Firm size	0.011	0.108	0.041	0.000	0.048	0.005
Unemployed	0.007	0.314	-0.014	0.147	0.007	0.703
Unemployed a year ago	-0.030	0.000	-0.008	0.421	-0.016	0.377
Education: first degree or above	0.022	0.002	0.061	0.000	0.080	0.000
Date of interview: year	0.098	0.000	0.129	0.000		
R Square	0.183		0.088		0.045	

Table 48 shows *A priori optimism* also has a negative influence on total wealth both currently and change in 5 years' time. The underlying reasons for such findings are similar to what I

found in Table 47. Older individuals tend to have higher levels of total wealth but this tendency doesn't seem to exist in the change in five years' time. Being married or healthy is associated with higher total wealth at present and these respondents' wealth level is likely to increase in a few years' time. Having a larger household has the opposite effect - even in 10 years' time, larger households have a lower increase in wealth compared to smaller households. Household income, a finance related occupation and education all positively affect one's total wealth, and the positive effect of higher income and education level last for at least 10 years.

Table 49 A posteriori optimism and total wealth

This table reports the regression results for Equation 17 using *TW0*, *TW5* and *TW10* as the dependent variable. *A posteriori optimism* is used as the measure of financial optimism. Variables listed in the left column including optimism and demographics are independent variables for this regression. The current level of total wealth and increase in total wealth in 5 and 10 years listed in the second row are the dependent variables estimated respectively in the regression analysis. Beta coefficients and the *p*-values associated with each coefficient are reported in the rest of the columns.

	Total Wealth					
	Total Wealth		**Change in 5 Years**		**Change in 10 Years**	
	Beta	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**
Optimism: A Posteriori Optimism	-0.031	0.000	-0.040	0.000	-0.007	0.683
Age	0.162	0.000	0.023	0.032	0.002	0.896
Male	0.007	0.317	-0.017	0.077	-0.004	0.823
Married	0.016	0.034	0.177	0.000	0.113	0.000
White	-0.014	0.038	-0.027	0.006	-0.029	0.093
Healthy	0.018	0.008	0.037	0.000	0.009	0.603
Household size	0.022	0.004	-0.087	0.000	-0.067	0.000
Annual household income (ln)	0.325	0.000	0.067	0.000	0.089	0.000
Business ownership	0.008	0.219	0.016	0.108	-0.003	0.842
Finance related occupation	0.041	0.000	0.033	0.001	0.017	0.306
Employment: permanent contract	-0.026	0.000	0.042	0.000	0.006	0.714
Firm size	0.014	0.045	0.041	0.000	0.048	0.006
Unemployed	0.009	0.225	-0.017	0.092	0.007	0.679
Unemployed a year ago	-0.029	0.000	-0.007	0.462	-0.017	0.327
Education: first degree or above	0.022	0.002	0.059	0.000	0.082	0.000
Date of interview: year	0.101	0.000	0.129	0.000		
R Square	0.185		0.089		0.044	

I found in Table 49 that *A posteriori optimism* has a negative impact on one's total wealth level, which is consistent with my findings from Table 47 and Table 48. Household income, firm size and educational level all have a positive influence on total wealth level even in 10 years.

5.5.1.4. Summary of Financial Optimism and Objective Well-being

In summary, results from Table 32 to Table 43 show that *Financial expectation*, which measures a general outlook of future financial situation is positively correlated with higher levels of investment income currently and the increase in the change of future overall and labour income. An individual who obtains higher gain from her investment is likely to feel positively about her future financial well-being. This positive outlook might help to improve her future income. *A priori optimism*, which measures one's financial optimism level by using historical returns as a benchmark, has a positive relationship with current overall income and medium to long term future income increases, but has a negative relationship with income increase in the short-term future. *A posteriori optimism* which measures the accuracy of an individual's forecasting ability has little correlation with current income but is negatively correlated with overall income and labour income increases in the future. Investors' high expectation but low realisation might be the underlying reason of this finding.

I found from Table 44 to Table 49 that financial optimism is positively correlated with an increase in financial wealth in future, but has a negative relationship with the increase in total wealth. I found that throughout the tables, financial optimism is negatively correlated with both current financial wealth and current total wealth which is consistent with my previous findings in chapter 4 that optimists are on average financially worse off than non-optimists. Due to this fact, although optimists improve their financial wealth in the future, their total wealth increase is still lower than non-optimists as increased house values are the biggest components of my total wealth measure.

5.5.2. Financial Optimism and Subjective Well-being

In this section, I investigate the relationship between financial optimism and subjective

well-being. Subjective well-being is represented by current and future changes in general happiness and satisfaction with life. By running a regression analysis, I hope to identify if staying optimistic is a rational approach for individuals to feel happy or stay satisfied with themselves. Section 5.5.2.1 reports how financial optimism affects current and future general happiness followed by an investigation into whether financial optimism impacts on life satisfaction in Section 5.5.2.2. Section 5.5.2.3 summarises the relationship between financial optimism and subjective well-being.

5.5.2.1. Financial Optimism and General Happiness

This section investigates whether financial optimism is correlated with both current happiness and changes in happiness in future. Beta coefficients on the relationship between optimism and demographics are reported from Table 50 to Table 55, followed by discussion.

I found in Table 50 that *Financial expectation* is significantly positively correlated with current happiness but it does not affect future happiness. Having higher income or financial wealth does not influence happiness which is consistent with findings from some previous literature (Cummins, 2000; Kahneman, Krueger, Schkade, Schwarz, & Stone, 2006). Being healthy increases the change in happiness 1 year and in 5 years' in the future, while unemployment reduces next year's change in happiness. Receiving private medical care while staying hospital is associated with higher level of changes in happiness in the next year but this does not have an effect in the longer term.

Table 50 Financial expectation and general happiness

This table reports the regression results for Equation 18 using *HAP0*, *HAP1*, *HAP5* and *HAP10* as the dependent variable. *Financial expectation* is used as the measure of financial optimism. Variables listed in the left column including optimism and demographics are independent variables for this regression. The current level of general happiness and increase in happiness in 1, 5 and 10 year(s) listed in the second row are the dependent variables that are estimated respectively in the regression analysis. Beta coefficients and the *p*-values associated with each coefficient are reported in the rest of the columns.

	Happiness							
	Happiness		**Change in 1 Year**		**Change in 5 Years**		**Change in 10 Years**	
	Beta	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**
Optimism: Financial Expectation	0.029	0.090	0.019	0.394	-0.044	0.307	-0.092	0.116
Age	-0.017	0.459	-0.028	0.348	0.015	0.798	-0.046	0.544
Male	-0.032	0.057	0.005	0.820	0.026	0.559	0.082	0.187
Married	0.026	0.140	-0.034	0.145	-0.110	0.021	-0.055	0.367
White	0.004	0.823	-0.012	0.572	-0.014	0.740	-0.056	0.325
Healthy	-0.001	0.957	0.048	0.039	0.101	0.029	0.041	0.514
Annual household income (ln)	0.027	0.215	-0.009	0.744	0.062	0.286	-0.063	0.400
Total financial wealth (ln)	-0.006	0.749	0.025	0.324	-0.033	0.520	0.101	0.164
Home ownership	-0.011	0.536	-0.009	0.700	0.050	0.290	-0.019	0.761
Business ownership	0.002	0.890	-0.005	0.810	0.023	0.586	-0.170	0.005
Employment: permanent contract	-0.047	0.023	-0.005	0.849	-0.020	0.696	0.047	0.503
Unemployed	0.003	0.874	-0.037	0.096	-0.022	0.614	0.058	0.360
Education: first degree or above	-0.014	0.429	0.016	0.494	-0.017	0.707	-0.038	0.539
Medical care: private	-0.030	0.072	0.058	0.009	0.048	0.284	0.124	0.043
Playing a useful role	0.136	0.000	-0.078	0.004	-0.013	0.806	-0.128	0.092
Constantly under strain	-0.050	0.029	-0.049	0.100	-0.048	0.440	-0.040	0.644
Problem overcoming difficulties	-0.020	0.389	-0.006	0.837	-0.023	0.716	0.122	0.157
Enjoy day-to-day activities	0.219	0.000	-0.158	0.000	-0.352	0.000	-0.118	0.142
Depressed	-0.233	0.000	0.154	0.000	0.200	0.002	0.259	0.005
Losing confidence	-0.058	0.017	0.023	0.463	0.064	0.347	0.117	0.214
Lower belief in self-worth	-0.175	0.000	0.096	0.001	0.012	0.839	-0.035	0.657
R Square	0.449		0.122		0.234		0.343	

Overall, demographic variables have very small effects on one's happiness but other subjective variables have much prominent influence on happiness. Thinking oneself to be playing a useful role or enjoying day-to-day activities is positively related to current happiness; however individuals with these characteristics might not increase their happiness level as much as others in future. Feeling under strain, depressed or losing confidence reduces current happiness. People who do not believe in their own self-worth are less likely to be happy. However, most subjective variables have very little effect on happiness level changes in five years, which indicates people do change their attitudes and feelings from time to time and current perceptions in various life domains are unlikely to last long-term.

Table 51 A priori optimism and general happiness

This table reports the regression results for Equation 18 using *HAP0*, *HAP1*, *HAP5* and *HAP10* as the dependent variable. *A priori optimism* is used as the measure of financial optimism. Variables listed in the left column including optimism and demographics are independent variables for this regression. The current level of general happiness and increase in happiness in 1, 5 and 10 year(s) listed in the second row are the dependent variables that are estimated respectively in the regression analysis. Beta coefficients and the *p*-values associated with each coefficient are reported in the rest of the columns.

	Happiness							
	Happiness		**Change in 1 Year**		**Change in 5 Years**		**Change in 10 Years**	
	Beta	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**
Optimism: A Priori Optimism	-0.003	0.866	0.021	0.346	-0.027	0.536	-0.059	0.322
Age	-0.025	0.283	-0.031	0.307	0.021	0.720	-0.028	0.710
Male	-0.032	0.060	0.006	0.798	0.023	0.610	0.071	0.247
Married	0.025	0.161	-0.036	0.124	-0.107	0.025	-0.047	0.441
White	0.004	0.814	-0.013	0.555	-0.012	0.770	-0.055	0.339
Healthy	-0.002	0.930	0.048	0.039	0.100	0.030	0.038	0.544
Annual household income (ln)	0.026	0.216	-0.009	0.762	0.059	0.308	-0.060	0.424
Total financial wealth (ln)	-0.008	0.680	0.025	0.330	-0.030	0.556	0.105	0.148
Home ownership	-0.012	0.517	-0.011	0.655	0.050	0.285	-0.022	0.717
Business ownership	0.003	0.845	-0.005	0.820	0.025	0.569	-0.167	0.006
Employment: permanent contract	-0.046	0.025	-0.003	0.903	-0.025	0.639	0.033	0.642
Unemployed	0.004	0.793	-0.038	0.086	-0.018	0.678	0.069	0.284
Education: first degree or above	-0.013	0.467	0.015	0.516	-0.015	0.735	-0.036	0.570
Medical care: private	-0.031	0.071	0.060	0.007	0.045	0.311	0.115	0.063
Playing a useful role	0.138	0.000	-0.078	0.004	-0.014	0.801	-0.129	0.091
Constantly under strain	-0.050	0.029	-0.050	0.092	-0.043	0.492	-0.030	0.732
Problem overcoming difficulties	-0.019	0.396	-0.007	0.822	-0.024	0.711	0.129	0.141
Enjoy day-to-day activities	0.219	0.000	-0.158	0.000	-0.353	0.000	-0.114	0.157
Depressed	-0.234	0.000	0.154	0.000	0.199	0.003	0.260	0.005
Losing confidence	-0.059	0.016	0.023	0.473	0.063	0.357	0.115	0.222
Lower belief in self-worth	-0.173	0.000	0.097	0.001	0.010	0.857	-0.048	0.546
R Square	0.449		0.122		0.233		0.338	

Table 51 shows that *A priori optimism* does not have a significant impact on one's current and future felicity. It seems that financial optimism does not always significantly correlate with achieving higher levels of happiness in the future. Male respondents are more likely to be unhappy during the current period. Married people have a lower increase in happiness in 5 years' time compared to unmarried people. Healthy individuals are more likely to be happier in both the short term and long term future.

Again, subjective variables have stronger correlations with happiness. However most positive subjective variables, such as thinking oneself playing a useful role and enjoying day-to-day activities, are positively related to current happiness but are negatively correlated with an increase in

happiness in future. This might be because people with these positive characteristics are more stable in their subjective well-being therefore their happiness level is unlikely to increase much. On the other hand, some of the negative variables such being depressed reduces current happiness but increase changes in happiness in future. This might be due to the increase in happiness is larger for people who are currently unhappy than those who are currently happy. I still found most subjective variables have very little effect on happiness in the longer term, which implies people change their attitudes and feelings fairly frequently and that these feelings are unlikely to last for a very long time.

Table 52 A posteriori optimism and general happiness

This table reports the regression results for Equation 18 using *HAP0*, *HAP1*, *HAP5* and *HAP10* as the dependent variable. *A posteriori optimism* is used as the measure of financial optimism. Variables listed in the left column including optimism and demographics are independent variables for this regression. The current level of general happiness and increase in happiness in 1, 5 and 10 year(s) listed in the second row are the dependent variables that are estimated respectively in the regression analysis. Beta coefficients and the *p*-values associated with each coefficient are reported in the rest of the columns.

	Happiness							
	Happiness		**Change in 1 Year**		**Change in 5 Years**		**Change in 10 Years**	
	Beta	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**
Optimism: A Posteriori Optimism	0.021	0.217	-0.058	0.007	-0.069	0.101	-0.123	0.033
Age	-0.023	0.339	-0.039	0.195	0.021	0.718	-0.033	0.658
Male	-0.032	0.066	0.005	0.835	0.024	0.584	0.070	0.248
Married	0.023	0.215	-0.033	0.155	-0.108	0.023	-0.045	0.461
White	0.006	0.721	-0.011	0.608	-0.010	0.809	-0.044	0.440
Healthy	0.002	0.935	0.047	0.045	0.100	0.030	0.032	0.611
Annual household income (ln)	0.022	0.324	-0.010	0.726	0.061	0.295	-0.073	0.332
Total financial wealth (ln)	-0.003	0.891	0.024	0.348	-0.033	0.519	0.103	0.154
Home ownership	-0.021	0.271	-0.010	0.670	0.052	0.266	-0.012	0.837
Business ownership	0.004	0.804	-0.003	0.890	0.023	0.594	-0.177	0.004
Employment: permanent contract	-0.033	0.118	-0.003	0.925	-0.022	0.677	0.043	0.535
Unemployed	0.003	0.865	-0.032	0.139	-0.020	0.656	0.062	0.324
Education: first degree or above	-0.019	0.307	0.018	0.436	-0.012	0.796	-0.026	0.679
Medical care: private	-0.031	0.081	0.056	0.012	0.044	0.324	0.120	0.051
Playing a useful role	0.145	0.000	-0.078	0.004	-0.015	0.781	-0.129	0.087
Constantly under strain	-0.042	0.081	-0.047	0.118	-0.043	0.488	-0.040	0.647
Problem overcoming difficulties	-0.014	0.571	-0.007	0.812	-0.023	0.723	0.136	0.115
Enjoy day-to-day activities	0.226	0.000	-0.158	0.000	-0.352	0.000	-0.115	0.150
Depressed	-0.241	0.000	0.152	0.000	0.201	0.002	0.256	0.005
Losing confidence	-0.059	0.020	0.023	0.476	0.057	0.400	0.109	0.244
Lower belief in self-worth	-0.159	0.000	0.101	0.001	0.019	0.741	-0.031	0.698
R Square	0.443		0.125		0.237		0.349	

I found in Table 52 that *A posteriori optimism* is negatively correlated with changes in future happiness even in 10 years' time. It seems that if an investor overestimates the improvement of her future finances, she is less likely to have an increased level of happiness in future time than

an investor that does not. Having high expectations and low realisations in one's financial situation does seem to bring less happiness after an individual realises the forecasting error (this is probably why *A posteriori optimism* does not seem to affect happiness immediately). Subjective variables are more likely to correlate with happiness than demographic variables.

5.5.2.2. Financial Optimism and Satisfaction with Life

I report the regression results on how optimism and demographics are correlated with satisfaction in Table 53 to Table 55. Life satisfaction includes current levels of satisfaction as well as increases in life satisfaction in 1 year and 5 years' time.

Table 53 Financial expectation and satisfaction with life

This table reports the regression results for Equation 19 using *SAT0*, *SAT1* and *SAT5* as the dependent variable. *Financial expectation* is used as the measure of financial optimism. Variables listed in the left column including optimism and demographics are independent variables for this regression. The current level of life satisfaction and increase in satisfaction in 1 and 5 year(s) listed in the second row are the dependent variables that are estimated respectively in the regression analysis. Beta coefficients and the *p*-values associated with each coefficient are reported in the rest of the columns.

	Satisfaction with Life					
	Satisfaction		**Change in 1 Year**		**Change in 5 Years**	
	Beta	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**
Optimism: Financial Expectation	0.043	0.046	0.049	0.248	-0.084	0.215
Age	0.059	0.046	0.036	0.546	0.036	0.712
Male	-0.072	0.001	0.036	0.385	0.056	0.424
Married	0.102	0.000	-0.100	0.021	-0.114	0.165
White	-0.005	0.795	0.070	0.090	-0.002	0.980
Healthy	0.134	0.000	0.072	0.101	-0.083	0.264
Annual household income (ln)	0.023	0.405	0.047	0.387	-0.040	0.692
Total financial wealth (ln)	0.045	0.071	0.045	0.337	-0.121	0.133
Home ownership	-0.001	0.980	-0.004	0.931	0.115	0.153
Business ownership	-0.039	0.062	0.004	0.921	0.054	0.426
Employment: permanent contract	-0.001	0.983	-0.017	0.748	-0.055	0.517
Unemployed	0.001	0.973	0.000	0.996	-0.106	0.116
Education: first degree or above	-0.017	0.440	-0.027	0.541	0.080	0.272
Medical care: private	0.008	0.701	0.011	0.793	-0.082	0.233
Playing a useful role	0.107	0.000	-0.007	0.901	0.027	0.746
Constantly under strain	-0.083	0.004	-0.010	0.859	-0.012	0.901
Problem overcoming difficulties	-0.021	0.460	-0.002	0.975	0.106	0.305
Enjoy day-to-day activities	0.047	0.078	0.029	0.583	0.003	0.969
Depressed	-0.161	0.000	0.116	0.063	0.047	0.651
Losing confidence	-0.027	0.389	-0.022	0.718	-0.026	0.806
Lower belief in self-worth	-0.206	0.000	0.104	0.073	0.123	0.186
R Square	0.341		0.047		0.119	

Table 53 shows that *Financial expectation* is positively correlated with current satisfaction with life but it does affect the change in such satisfaction in the future. Males are less satisfied with life than females. Married people are more satisfied with their life during the current year but their satisfaction does not increase as much as unmarried people in long term future. Being healthy and having higher level of financial wealth are positively associated with current satisfaction. Playing a useful role or enjoying day-to-day activities has a positive relationship with current life satisfaction while feeling under strain, depressed or have lower belief in one's self-worth has a negative relationship with satisfaction. But these correlations became insignificant or are inconsistent for changes in satisfaction even in just 1 year's time.

Table 54 A priori optimism and satisfaction with life

This table reports the regression results for Equation 19 using *SAT0*, *SAT1* and *SAT5* as the dependent variable. *A priori optimism* is used as the measure of financial optimism. Variables listed in the left column including optimism and demographics are independent variables for this regression. The current level of life satisfaction and increase in satisfaction in 1 and 5 year(s) listed in the second row are the dependent variables that are estimated respectively in the regression analysis. Beta coefficients and the *p*-values associated with each coefficient are reported in the rest of the columns.

	Satisfaction with Life					
	Satisfaction		**Change in 1 Year**		**Change in 5 Years**	
	Beta	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**
Optimism: A Priori Optimism	-0.014	0.519	0.063	0.129	-0.005	0.947
Age	0.048	0.104	0.033	0.574	0.050	0.614
Male	-0.071	0.001	0.040	0.343	0.053	0.445
Married	0.101	0.000	-0.107	0.013	-0.106	0.197
White	-0.005	0.799	0.066	0.111	0.003	0.960
Healthy	0.133	0.000	0.073	0.096	-0.082	0.268
Annual household income (ln)	0.023	0.410	0.047	0.394	-0.051	0.609
Total financial wealth (ln)	0.042	0.093	0.045	0.346	-0.112	0.168
Home ownership	-0.001	0.982	-0.009	0.837	0.115	0.158
Business ownership	-0.036	0.081	0.005	0.907	0.047	0.493
Employment: permanent contract	0.000	0.991	-0.010	0.848	-0.051	0.555
Unemployed	0.004	0.850	-0.002	0.959	-0.104	0.127
Education: first degree or above	-0.015	0.509	-0.030	0.489	0.084	0.248
Medical care: private	0.006	0.770	0.014	0.746	-0.079	0.255
Playing a useful role	0.109	0.000	-0.008	0.885	0.025	0.770
Constantly under strain	-0.081	0.005	-0.016	0.774	-0.002	0.981
Problem overcoming difficulties	-0.021	0.464	-0.001	0.980	0.093	0.371
Enjoy day-to-day activities	0.047	0.078	0.029	0.576	-0.003	0.974
Depressed	-0.163	0.000	0.116	0.063	0.044	0.670
Losing confidence	-0.027	0.378	-0.026	0.678	-0.027	0.801
Lower belief in self-worth	-0.205	0.000	0.112	0.053	0.127	0.174
R Square	0.339		0.048		0.113	

I found in Table 54 that financial *A priori optimism* has no significant effect on life satisfaction[1] both currently and in future. Previous literature shows that optimism contributes significantly to life satisfaction (Dember & Brooks, 1989), however such optimism was measured as a general outlook of one's life without a benchmark, which is similar to what I found in Table 53 with *Financial expectation* as my measure of financial optimism. The findings regarding the relationship between *A priori optimism* and satisfaction and its implication are very similar to what I found in Table 51. Being male or self-employed causes one to be less satisfied with life than others. Subjective variables still have prominent influences. Depressed individuals or people who are feeling under strain are currently not satisfied with their life. People who have a lower belief in their self-worth are also less likely to be satisfied with life but they become more satisfied in the following year.

[1] No result on change in life satisfaction in 10 years' time is reported due to the limitation of my data.

Table 55 A posteriori optimism and satisfaction with life

This table reports the regression results for Equation 19 using *SAT0*, *SAT1* and *SAT5* as the dependent variable. *A posteriori optimism* is used as the measure of financial optimism. Variables listed in the left column including optimism and demographics are independent variables for this regression. The current level of life satisfaction and increase in satisfaction in 1 and 5 year(s) listed in the second row are the dependent variables that are estimated respectively in the regression analysis. Beta coefficients and the *p*-values associated with each coefficient are reported in the rest of the columns.

	Satisfaction with Life					
	Satisfaction		**Change in 1 Year**		**Change in 5 Years**	
	Beta	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**
Optimism: A Posteriori Optimism	-0.015	0.501	-0.046	0.264	-0.109	0.102
Age	0.044	0.146	0.020	0.729	0.047	0.631
Male	-0.074	0.001	0.039	0.356	0.060	0.390
Married	0.109	0.000	-0.100	0.020	-0.117	0.152
White	-0.006	0.792	0.072	0.082	0.001	0.985
Healthy	0.125	0.000	0.069	0.115	-0.077	0.299
Annual household income (ln)	0.027	0.345	0.042	0.438	-0.034	0.735
Total financial wealth (ln)	0.054	0.038	0.049	0.302	-0.120	0.135
Home ownership	-0.007	0.772	-0.004	0.923	0.116	0.150
Business ownership	-0.036	0.101	0.006	0.875	0.059	0.384
Employment: permanent contract	-0.005	0.843	-0.007	0.891	-0.056	0.508
Unemployed	0.007	0.765	0.003	0.949	-0.100	0.140
Education: first degree or above	-0.013	0.585	-0.022	0.612	0.086	0.234
Medical care: private	0.004	0.872	0.004	0.917	-0.091	0.185
Playing a useful role	0.096	0.000	0.000	0.999	0.020	0.808
Constantly under strain	-0.074	0.013	-0.001	0.980	0.002	0.986
Problem overcoming difficulties	-0.030	0.322	-0.008	0.886	0.092	0.369
Enjoy day-to-day activities	0.039	0.162	0.028	0.591	0.000	0.999
Depressed	-0.180	0.000	0.114	0.068	0.055	0.596
Losing confidence	-0.029	0.367	-0.026	0.679	-0.038	0.717
Lower belief in self-worth	-0.192	0.000	0.114	0.050	0.137	0.140
R Square	0.331		0.046		0.124	

Results in Table 55 shows that *A posteriori optimism* does not correlate with current as well as future changes in satisfaction with life. Effects of demographic and subjective variables on life satisfaction are very similar to what I found in Table 53 and Table 54.

5.5.2.3. Summary of Financial Optimism and Subjective Well-being

In summary, *Financial expectation* in my study defined as a general financial outlook for the future without a benchmark is most similar to many of the definitions of optimism in previous literature. The regression results generated by using *Financial expectation* as my measure of financial optimism produce consistent findings as in the existing literature. *Financial*

expectation is significantly positively correlated with both happiness and life satisfaction for the current year. However, its long term impact on subjective well-being is insignificant. *A priori optimism* and *A posteriori optimism* have little influence on current happiness and satisfaction but *A posteriori optimism* is negatively correlated with the increase in future happiness. It seems that an investor is less likely to become very happy once he realises that his actual financial outcome is low compared to his expectation of his financial situation.[1]

5.5.3. Summary

The overall findings in this section indicate that optimists are not financially better off but their income and financial wealth is on the rise. Optimists experience an increase in their financial wealth in five years but their optimism does not seem to increase their total wealth, even when I look into the longer term future. Perhaps the positive influence of financial optimism on one's wealth level is very limited and it is not enough to largely increase total wealth which includes home value. Overall, financial optimism seems to have a significant positive effect on one's future financial improvement but this effect is fairly small compared to other demographical variables and does not benefit one's total wealth level. These findings imply that given the financial situation an individual is in, being financially optimistic brings in benefits on improving financial well-being.

I also found slightly different results based on what measure of financial optimism I use.

[1] I replaced the insignificant wealth variables with variable indicating whether respondents are religious and their attitude towards friends and neighborhood as these variables may have influences on happiness and satisfaction (Vittersø, 2000). I found that being religious is significantly positively correlated with happiness and life satisfaction for the current year but its effect regarding future SWB is not significant. Respondents, who value their friends as important and who feel they belong to the neighborhood, have significantly high scores for life satisfaction but this also barely affects their future subjective well-being.

Financial expectation is positively correlated with current happiness and satisfaction, while *A priori optimism* and *A posteriori optimism* do not correlate with current subjective well-being. However, *A posteriori optimism* has a negative impact on future happiness. Many demographic variables do not have significant influences on subjective well-being. Compared to objective variables, subjective variables seem to be highly correlated with each other and have more dominant effects on happiness and satisfaction, which is supported by previous literature (Vittersø, 2000).

5.6. Conclusion

Based on the analysis I conducted in this chapter, I found the relationship between financial optimism and well-being is not straightforward but somewhat complicated. Looking into whether financial optimism affects objective well-being, I found that financial optimism improves future financial wealth level but does not contribute to an increase in total wealth level. Financial optimism is also correlated with subjective well-being while different measures of optimism have different implications. The details are explained in the following paragraphs.

Financial expectation, which measures a general outlook of future financial situation, is found to be positively associated with current investment income and an increase in future income. *A priori optimism*, which measures one's financial optimism level by using historical return as a benchmark, has a positive relationship with current income and an increase in income in 5 and 10 years' time. *A posteriori optimism*, measuring the accuracy of individual's forecasting ability against realisations, has little correlations with current income but is negatively related to income in future. Investors' high expectation but low realisation might be the primary reason for this phenomenon.

I also found that financial optimism is negatively correlated with current financial and total wealth, which is consistent with my findings that optimists are on average financially worse off than non-optimists in chapter 4. Although optimists improve their financial wealth in future, their total wealth increase is still lower than non-optimists as increased house values, the biggest components of my total wealth measure, outweighed the positive effect of optimism.

Different results were produced based on what measure of financial optimism I use when studying optimism and subjective well-being. *Financial expectation* is significantly positively

related to both current happiness and life satisfaction but its long term influence on subjective well-being is insignificant. *Financial expectation* in this study is similar to many of the definitions of optimism in previous literature. Therefore the results generated using *Financial expectation* produced the most consistent findings on optimism and subjective well-being as in the literature. *A priori optimism* and *A posteriori optimism* have little influence on current happiness and satisfaction but *A posteriori optimism* is negatively correlated with the increase in future happiness. It's possible to imagine that if an investor's realisation is lower than his expectation of his financial situation, it is likely that he becomes unhappy. Compared to demographic variables, subjective variables seem to be highly correlated with each other and therefore have prevailing effects on happiness and satisfaction as suggested in previous literature (Vittersø, 2000).

The overall results from this chapter indicate that the income and financial wealth of optimists are on the rise although optimists are not financially better off at the start. Being optimistic provokes an increase in financial wealth but its effect on increasing total wealth is very limited. The suggestion here is that given the financial situation an individual is in, it is better to be optimistic as optimism brings in certain benefits on improving objective well-being. However, one should not have unrealistic expectations on optimisms benefit and amplify too much what optimism can do. In terms of financial optimism and subjective well-being, evidence shows that respondents' might have made their judgments on their financial situation based on irrationality. In other words, financial optimism could be a delusion that respondents create in order to feel happy or satisfied with themselves. The warning here is that if an individual is financially optimistic, his future happiness might reduce due to the potentially low realisations.

I believe the contributions of this research lie in the following aspects. Previous research on the pros and cons of optimism are not conclusive as no published research studied optimism and both objective and subjective well-being at the same time using large-scale survey data. I

utilised the BHPS data and explored the complex relationship between optimism and well-being. In this chapter, I applied optimism measures within the financial decision making domain which spawned a new avenue of investigation of the determinants of well-being. There is also a lack of field studies on the effect of optimism on well-being.

This study is not without its limitations. My findings suggest it is better off to be optimistic but the general concern is that optimism might not be something one can control. In other words, it might be hard to voluntarily be or not be optimistic. Optimism might have its roots in one's personality, shaped by updated information, determined by risk attitude, or even altered in different environments. Due to the limitation of the field survey data and unavailability of the relevant private information that the survey respondents used to make financial decisions, it is almost impossible to provide reliable answers to these questions by using survey data. These shortcomings of field survey data motivated my research in Chapter 6 which attempts to explore the contributors of financial optimism by conducting controlled experiments.

Chapter 6

Feedback, Framing, Personality and Risk Attitude

- Experiments on Factors Affecting Financial Optimism

6.1. Introduction

By analysing the BHPS data in chapter 4 I found that financially optimistic people prefer to invest in risky portfolios over risk-free portfolios and borrow higher levels of personal debt. In chapter 5 a further investigation into whether financial optimism benefits individuals' well-being using the same data set found that financial optimism is positively associated with current income level and future increase in financial wealth, but it does not improve one's overall wealth significantly. I also found that financial optimism is correlated with current happiness and satisfaction but reduces future felicity.

However, the factors that affect financial optimism are still unclear based on my previous studies by using survey-based field data. While the BHPS provided me with vast number of real world data, it does not reveal to me all the information that is used by respondents to make a financial decision. The BHPS collects data from respondents on an annual basis and therefore I suspect a lot of information used by an individual to form an answer to the questionnaires might be diluted or lost over such a large sampling interval. For example, when respondents form their judgments on their financial situation for each year, their answers might be quite different depend on the timing of the actual BHPS questionnaire interview as their mood, memory, willingness to participate or information available to them at the particular point of time might affect their judgments (Nygren, Isen, Taylor, & Dulin, 1996; Carroll, Sweeny, & Shepperd, 2006). In experiments in this chapter, I have total control over the relevant financial information available to the participants to make their investment decisions, therefore in theory I can observe their investing behaviour, and isolate and identify the factors that are likely to affect their optimism level.

By using an experimental approach, this chapter explores the effect of a number of factors of

interest on financial optimism. I will try to answer questions such as “Can optimism be reinforced or reduced by historical investment performance or is it constant over time?”, “Does financial optimism correlate with personality traits?”, or “Is financial optimism in fact risk-taking?”. The layout of this chapter is as follows.

Section 6.2 reviews literature on the factors that I aim to explore regarding their effects on financial optimism. Besides general literature on the determinants of optimism discussed in chapter 2, the literature survey in this chapter investigates factors that influence optimism such as feedback (Carroll, Sweeny, & Shepperd, 2006), framing (Lauver & Rubin, 1990), certain personality traits (Eroglu & Croxton, 2010), and risk tolerance (Puri & Robinson, 2007). Questions still remain on whether and how these factors affect financial optimism in particular. Section 6.3 proposes the research hypotheses for this chapter and discusses the rationale.

In section 6.4, I present the design of my experiments used in this chapter. The experiments consist of a demographic questionnaire, an eight-step portfolio allocation task, and a 120-iterm personality test. I reveal how the experiments are designed in order to ensure relevant factors suspected to affect optimism can be tested without being influenced by confounding factors. The rationale of the experiment design is discussed in great details. I define financial optimism by implementing the theoretical framework on optimism proposed in chapter 2 with the controlled experiment data from this chapter. Definitions on other variables used in these experiments are also presented. At the end of the section, regression models are proposed for analysis.

In section 6.5, I found from the regression analysis evidence that feedback on previous portfolio returns affect financial optimism in different ways depending on whether people forecast returns in absolute values or in relative terms. When forecasting in absolute values, participants increase optimism when they receive negative feedback. When forecasting portfolio returns in relative terms, receiving negative feedback reduces financial optimism. Framing of the experiments has

affected participants' financial optimism. I found that financial optimism is related to personality traits, such as extraversion, modesty and altruism. Financial optimism is also positively correlated with attitude on risk tolerance and risk-taking behaviour in financial decisions.

An important contribution to the existing literature is my domain specific definition for optimism. I find an individual investor's optimism level by asking them to make a number of investment decisions and forecasts, and comparing these domain specific financial measures. I used quantitative financial figures from the individual's historical investment performance and investment forecast data.

I do not measure financial optimism using potentially biased self-reported data such as asking questions to collect self-reported scoring of optimism as reported in previous experimental studies (Weinstein, 1980; Anderson & Galinsky, 2006). By not using generalised self-reported optimism measures, such as the Life Orientation Test (LOT) optimism measure, I avoided criticism that the LOT may simply measure neuroticism and a tendency to experience negative effect (Smith, Pope, Rhodewalt, & Poulton, 1989). The goal in my experiments is to study domain specific optimism in the financial decision making task.

By conducting this research in the format of a controlled experimental environment, I was able to minimise the affect of extraneous factors on an investor's optimism of their investment performance. For example, I avoided the situation that measures of optimism can generate a signal even if the forecast is rational due to subjects' private information not revealed in the BHPS survey in Chapter 4.

I believe findings in this chapter fill gaps in the literature on optimism studies. Previous literature studied determinants including anticipating feedback on general optimism, but there was little research on how financial optimism changes after receiving feedback. Comparing two forecasting

scenarios on expectations within the same experiment design is rare (Glaser, Weber, Langer, & Reynders, 2007), and the study in this chapter is the first to look into how framing influences financial optimism. The effect of detailed personality facets on financial optimism also has never been researched before, and whether an attitude on risk tolerance in an investment decision is correlated with optimism in the same financial decision making domain was unclear.

6.2. Literature Review

The general literature on the motivational and cognitive explanations for optimism (Heaton J. B., 2002; Batchelor, 2007; Kahneman & Lovallo, 1993; Klein & Helweg-Larsen, 2002; Anderson & Galinsky, 2006) has been reviewed in Chapter 2. In this section, I conduct a further literature survey on a number of determinants of optimism and identify areas with insufficient research on the predictors of optimism. Section 6.2.1 introduces existing studies on how anticipating feedback can affect optimism. The interaction between optimism and framing of information is discussed in section 6.2.2. Section 6.2.3 reviews how personality traits and demographical differences could affect optimism.

6.2.1. Feedback

The literature reviewed in section 2.3 has provided evidence on the link between general optimism and motivation, the illusion of control, and a positive illusion with oneself. The belief that we are better than average commonly exists among individuals and this leads to optimism over one's own ability of achieving desirable results or avoiding unfavourable events. Some other research found that optimism is not consistent over the time but can be enhanced or reduced via new activities or upon the arrival of new information (Korhonen, Mano, Stenfors, & Wallenius, 2008; Carroll, Sweeny, & Shepperd, 2006). Therefore, it would be interesting to find out whether experiment subjects will increase or reduce their self belief and optimism or whether optimism would persist once they are provided with objective feedback regarding their abilities.

Research found that optimism is a "thinking style" that can be reinforced or suppressed through cognitive activities (Seligman, 1991; Korhonen, Mano, Stenfors, & Wallenius, 2008). Optimism

driven by self-efficacy can be enhanced through processes on logical thinking based on available facts. In the stock market, previous capital gains encourage risk-taking behaviour while previous losses increase risk aversion through intensifying the fear of having further losses (Barberis, Huang, & Santos, 2001). The level of optimism can be manipulated in an experimental environment, an induced optimistic (pessimistic) outlook is likely to lead the decision maker to be more optimistic (pessimistic) and aim at higher (lower) levels of future achievement (Korhonen, Mano, Stenfors, & Wallenius, 2008). In the paper subjects' decision quality was observed in terms of allocating their resources (time) to a number of activities in computerised "biased" scenarios. In order to test the influence of induced optimism (pessimism) on the subsequent performance in decision making processes, Korhonen, et al (2008) provided some decision makers with a positive basis for their future choices and others a more pessimistic outlook for their choices. They found optimism leads to choices of higher levels of success and pessimism to lower levels. Optimistic models also significantly improved the decision makers' emotional states and their attitudes towards the decision model. However, Korhonen, et al's (2008) research is based on an artificially generated optimistic (pessimistic) outlook, therefore they do not study the effect on future decision making processes that is caused by the reported success or failure of the subject's own historical decisions.

Some studies have focused on only a loss situation. Etchart-Vincent (2009) studied the sensitivity of probabilistic optimism to the payoff structure of a gambling situation in the loss domain. The study introduced three types of gambles: two homogeneous gambles (involving either small or large losses), and heterogeneous gambles involving both large and small losses. Etchart-Vincent (2009) found that compared to small-loss gambles, large-loss gambles can enhance probabilistic optimism while gambles offering both small losses and large losses seem to increase pessimism.

The above literature discussed the reasons that cause optimistic bias, but the story of optimism

has yet another side. Recent research has studied why optimism declines when subjects anticipate self relevant feedback (Carroll, Sweeny, & Shepperd, 2006). Overly optimistic predictions can incur unfavourable effects on the pleasure of outcomes (McGraw, Mellers, & Ritov, 2004). They observed that an overwhelming majority of basketball players were overly optimistic reflected by their overconfident predictions of performance. They found optimistic beliefs can have negative effects on the pleasure of outcomes in a task of physical skill. For most players, accurate self assessments make the task more enjoyable. De-biased players also experience a reduction in displeasure caused by failures compared to overconfident players as they were better calibrated to the likelihood of success. McGraw et al's (2004) research is consistent with previous studies suggesting lowering one's expectations would decrease disappointment and minimize regret (Shepperd, Ouellette, & Fernandez, 1996; van Dijk, Zeelenberg, & van der Pligt, 2003; Kopalle & Lehman, 2000). Van Dijk et al (2003) also found that people may use lowering their expectation as a strategy to avoid future disappointments when self-relevant feedback about the outcome is anticipated in the immediate future.

People show a sharp decline in optimism when they anticipate self-relevant feedback in the near future (Carroll, Sweeny, & Shepperd, 2006). Carroll et al (2006) suggested that there are mainly two categories of explanations for a shift in subjects' prediction downwards. The first category explains the reduction in optimism as a response to new information. This shift represents an intention to adjust predictions in the direction of greater accuracy. Reconsidering existing data, the arrival of new data, and the predictor's current mood can be sources of information for the prediction shift. The second category explains the decline in optimism to brace oneself for unfavourable outcomes. People adjust their predictions to avoid disappointment, to manage how they feel about the negative outcomes and to protect themselves against the psychological impact of an undesired outcome. Kirkebøen and Teigen (2010) argue that regret experienced in the pre-outcome period has an important function that post-outcome regret does not have. Pre-outcome regret can also motivate the decision maker to reconsider the ongoing decision

process and reverse the initial prediction. In my experiment, I hope to quantify previous losses and gains and observe how feedback affects the level of optimism and decision making processes.

Positive or negative psychological affects might be a channel through which past experience on losses and gains could affect optimism. Nygren et al (1996) tested the influences of positive affect on thinking and decision making. They induced positive affect in their experiments by providing a gift (a bag of candy in their study) to participants and found that optimism among participants with positive affect significantly enhanced their estimates of the probabilities of winning relative to losing. However, such enhancement in estimation did not lead to subject actions, therefore such optimism led by positive affect does not seem to be dangerous in their study. Nygren et al (1996) suggest that the reason that positive affect can lead to "cautious optimism" may be two fold. When individuals are in positive mood, judgments are framed strictly on probability estimates and not actual choices. Positive mood is likely to lead to thoughts about positive material in memory (Isen, Shalker, Clark, & Karp, 1978). However, when it comes to choices, such bias in probability estimation might not be the determining factor. Perceived negative value or utility of losses induces conservation and self-protection in choice situations (Isen & Patrick, 1983). The anticipated impact related to a real loss is greater for someone in a positive mood than in a neutral state as people who are feeling happy are more motivated to maintain their current felicity and avoid potential losses (Isen & Simmonds, 1978; Mischel, Ebbesen, & Zeiss, 1976).

Most of the above literature focused on the effect of anticipating feedback on the performance of an expectation or forecast. There are a number of studies on the interplays between feedback and behaviour after feedback is received, and most of these studies focus on how feedback

could influence overconfidence[1]. The majority of research on probability judgment found that people's judgments tend to be overconfident and recent studies found that such phenomenon is resistant to the attempts at reducing overconfidence by providing feedback (Bolger & Onkal-Atay, 2004). Whether feedback works on changing confidence levels depends on a number of factors such as the difficulty of the tasks, differences among individuals or the types of feedback provided (Pulford & Colma, 1997; Eberlein, Ludwig, & Nafziger, 2010; Onkal & Muradoglu, 1995).

Pulford and Colma (1997) found evidence that feedback could improve calibration only when questions are constantly hard in their experiment. Such feedback may not be necessarily from the experimenter but could come from participants' own evaluation of how well they performed in the task. Social pressure might play an important role in reducing overconfidence upon feedback when the questions are hard. People lower their overconfidence during hard tasks to save face in case of failure. However, social pressure does not seem to increase confidence when tasks are easy for under-confident individuals, because it may be a way of boosting self-esteem in case of success if low confidence is expressed beforehand.

Feedback affects overconfidence in the decision-making of some individuals but not on all (Eberlein, Ludwig, & Nafziger, 2010). Some individuals take an advantage of feedback and improve their decision making process while others ignore feedback. Besides, some subjects appear to be confused by feedback and mistakes in decision-making can even be caused by the overreaction to feedback. Overall, overconfidence does not vanish completely over time. Contrary to Eberlein et al (2010), Bolger and Onkal-Atay (2004) found that forecasters learnt to evaluate information better and the initial overconfident forecasts were improved significantly

[1] Overconfidence indicates an interval for belief while optimism/pessimism is the direction of such belief. For example, an individual can be overconfidently pessimistic about certain events.

after feedback.

Research also shows various types of feedback have different level of effectiveness on forecasting accuracy. Three types of feedback were given to subjects in Onkal and Muradoglu's (1995) experiment: (a) simple outcome feedback, (b) outcome feedback presented in the task format and (c) performance feedback in the form of an overall accuracy score in addition to detailed calibration information. They found that while all feedback groups improve calibration, only task-formatted outcome feedback and performance feedback improve forecasters' skill. Stone and Open (2000) provided subjects with either performance feedback (provides information about the accuracy of one's judgments) or environmental feedback (provides information about the task to be predicted) and they found that performance feedback reduces participants' overconfidence while environment feedback led to an increase in overconfidence.

There is very little research regarding how receiving feedback would affect optimism. When it comes to decision-making, people tend to fall into two biases (Dunning, Heath, & Suls, 2004). One is that the predictions they make are likely to be too optimistic and the other bias is that the confidence they place in the optimistic or pessimistic predictions is too high and the accuracy of the forecasts is low. The neglect of the lessons of past experience is one of the main reasons contributing to such effects. People ignore previous experience because they often only consider the unique features of the current task, and focus on their abilities and resources to solve future problems but forget their own or other people's past experience of similar situations (Kahneman & Lovallo, 1993; Buehler, Griffin, & Ross, 2002; Dunning, Heath, & Suls, 2004).

In the domain of physical health, exposure to negative life events can reduce optimism about similar events that might take place in the future (Dunning, Heath, & Suls, 2004). When given computer-generated personalised risk feedback about getting certain diseases or encountering

accidents, patients' optimism or pessimism levels on some diseases and accidents change upon receiving such feedback (Kreuter & Strecher, 1995). However, the effectiveness of feedback is inconsistent across events as individualised risk feedback did not alter patients' perception of their heart attack and motor vehicle crash risks.

The majority of research on feedback and optimism focus on the stage of before feedback is given, in other words, how anticipating feedback could affect optimism. As for the stage after feedback is received, the effect of receiving feedback on confidence in forecasting has been investigated in a number of studies. However, there is little literature on how receiving feedback could shift optimism levels. Compared to most of previous research which ask participants to make forecasts after being given a single piece of feedback such as Kreuter and Strecher (1995), my research studies feedback and financial optimism using experiments with several stages, and feedback about previous decision making performance is reported to subjects provide at each stage. This enabled me to conduct a detailed study of the iterative interplay between feedback and optimism. By giving individual more frequent feedback based on their historical performances I believe I've created a controlled experiment which is more similar to the situations where investors make financial decisions in reality. I also focus on domain specific financial optimism in my research instead of indicators of general optimism or optimism in health.

6.2.2. Framing

Optimism could also have interactive effects with the framing of information (Lauver & Rubin, 1990). Positive and negative framed scenarios might induce different reactions from optimists and pessimists (Bier & Connell, 1994). Framing affects decision making and shifts preference when the same problem is framed in different ways (Tversky & Kahneman, 1981). According to Tversky and Kaheneman (1981), the dependence of preferences on how the decision problems

are formulated is a concern for the theory of rational choice. Reversals of preference are found in choices of monetary outcomes and in questions regarding the loss of human lives although the preference reversals or other errors of choice are not necessarily irrational. They propose that the phenomena in decision making due to framing effects can be explained by prospect theory which based on the assumption that people weight losses more than equivalent gains. However, framing effects greatly diminish and even disappear when participants have access to credible advice on how to make decisions (Druckman, 2001).

Tversky and Kahneman (1981) use the term decision frame in a relatively broad sense and the frame is controlled partly by the formulation of the problem and partly by decision makers' characteristics (Kuhberger, 1998). The strict definition of framing relates to how the same problem is differently described, while the loose definition of the term refers to an event that can be induced from other contextual features of a problem and from individual characteristics (Kuhberger, 1998).

The existence of framing effects has been evidenced in medical and clinical decisions, perceptual judgments, consumer decisions, responses to social issues, etc (Levin, Schneider, & Gaeth, 1998). Schmitz and Ziebarth (2011) found that framing of price differences between health plans has a substantial impact on price competition and price sensitivity in the health insurance market. Various other studies also show price framing affects consumer decision making and the perceived value of goods (Bertini & Wathieu, 2006; Chetty, Looney, & Kroft, 2009; Wallace & Huck, 2010).

In particular, studies show that giving statistics to participants in absolute or relative terms has an influence on subjects' choices. When patients faced with choosing between two treatments, the majority choose the treatment framed as a relative benefit rather than the one expressed as an absolute benefit. This result holds even when adequate information on the underlying risk of

death was provided so that the relative benefit could be converted to absolute benefit (Malenka, Baron, Johansen, Wahrenberger, & Ross, 1993). According to Malenka et al (1993), their findings might be due to "pseudocertainty" effect which can occur when a decision requires conditional evaluation (Tversky & Kahneman, 1986). In Malenka et al's (1993) study, the benefit of the medication presented in relative terms is conditional on the underlying risk of dying and the underlying risk of death was eliminated from consideration, therefore the sense of certainty of making the choices is illusive. When making the decision, patients might simply compare the relative benefit with the absolute benefit.

Similar framing effects on decision-making are also found in research regarding consumer choices. Hastings and Tejeda-Ashton (2008) demonstrated expressing fees in pesos instead of annual percentage rates leads to more awareness of fees and choices of investment funds with lower average fees among the financially illiterate. By using individual-level panel data, Schmitz and Ziebarth (2011) find reforms by German federal regulation, requiring health insurance companies to express price differences between health plans in absolute values rather than percentage point payroll tax differences, led to a six-fold increase in individuals switching probability and a three-fold demand elasticity increase.

In studies analysing return and volatility expectation of financial markets, the majority of research found that there is a framing effect when investors form expectations (Glaser, Weber, Langer, & Reynders, 2007). Some studies asking for future price levels find mean reverting expectations (De Bondt, 1991; O'Connor, Remus, & Griggs, 1997; Siebenmorgen & Weber, 2004), while other studies that ask for percentage return forecast find trend continuation (Shiller, 2000; Graham & Harvey, 2003). However, these studies do not ask the subjects to forecast future price levels and returns within the same experiment design to study the effect of how the questions were asked on expectations (Glaser, Weber, Langer, & Reynders, 2007). Glaser et al (2007) ask half of their subjects to make future forecasts in price levels and the other half to

forecast in returns. They found return forecasts are significantly higher than price level forecasts in upward sloping time-series, but in down ward sloping time-series, return forecasts are significantly lower than price forecasts.

Existing literature showed framing of a problem or information affects decision making and the formation of expectation in various social domains. Therefore, I suspect by framing experiment situations differently, for example by asking subjects to forecast price levels versus forecast return percentages, subjects' optimism level would be different. To my knowledge, my research is the first study attempting to investigate how this type of framing affects financial optimism.

6.2.3. Personality and Other Individual Differences

I learnt from the literature that optimism is not constant throughout the time and can be reinforced by environmental factors. However, the relationship between financial optimism and personality traits is still ambiguous. Eroglu and Croxton (2010) found some personality traits are related to optimism in forecasting. Personality is a set of traits that drive people's behaviour and is consistent across situations and time periods (Levy, Cober, & Norris-Watts, 2004). In Eroglu and Croxton (2010), they measure personality with the Big-Five Model which is the most widely accepted model of personality (Judge & Ilies, 2002). The Big-Five Model includes five broad domains of personality and these five factors are conscientiousness, neuroticism, extraversion, agreeableness and openness to experience[1] (Goldberg, 1993). Eroglu and Croxton (2010) found personality traits are associated with optimistic bias in adjusting forecasts. Agreeableness decreases optimistic bias while openness to experience increases it. Other

[1] The representative characteristics and the Big-five personality factors (Eroglu & Croxton, 2010): *Conscientiousness* is associated with being dependable, orderly, organized, responsible, practical, thorough, hardworking and thrifty; *Neuroticism* is related to being depressed, tense, nervous, angry, unstable, discontented, emotional, envious, worried and uneasy; *Extraversion* is represented by characteristics like being sociable, outgoing, energetic, talkative, bold, assertive, adventurous and gregarious; *Openness to experience* is connected with being creative, imaginative, inventive, intelligent, analytical, reflective, curious and sophisticated; *Agreeableness* is linked to being courteous, polite, trusting, nice, kind, gentle and pleasant.

personality traits, such as extraversion and conscientiousness, do not significantly impact on optimism bias.

Personality can impact on people's judgment and decision-making behaviour through information processing cognitive style, and affect mood-states (Eroglu & Croxton, 2010). Two distinct information processing styles are presented when individuals make decisions (Epstein, 1994). One processing system is more rational, controlled and conscious, and is more likely to be used by individuals who are more conscientious, open to experience and emotionally stable (an absence of neuroticism) when making decisions. The other system is more experiential, intuitive and emotional, and tends to be preferred by individuals who are more subject to cognitive biases (Handley, Newstead, & Wright, 2000; Eroglu & Croxton, 2010). From a perspective of mood status, extraversion is related to positive affect while neuroticism is associated with negative affect. According to Bower (1981; 1991), positive (negative) moods produce more positive (negative) judgments.

Besides personalities, Eroglu and Croxton (2010) also found other individual differences such as age, gender, and education do not contribute significantly to effect forecasters' judgmental adjustments. However, prior experience of the current position and challenge seeking encourage forecasters to make judgmental adjustments. Greater variability in statistical forecast errors decreases the level of optimism while age increases it. In my study, I hope to identify whether personality traits and demographics are contributing factors of financial optimism, or whether the level of financial optimism transforms over time and is more associated with other changing factors, such as feedback about historical performance.

In the analysis part of this chapter, I will investigate whether personality has any correlations with optimism in the financial decision making domain. This has never been studied before. I also use the five big factors of the personality traits together with the thirty facets that compute

the five big factors to examine whether financial optimism is affected by personality traits.

6.2.4. Summary

After looking into the general literature on the motivational and non-motivational determinants of optimism in section 2.3, I reviewed a number of factors of interest that contribute to changes in the level of optimism. Optimism evolves with one's experience including anticipating feedback, or changes with particular environmental factors such as the framing of information. When expecting feedback, people might lower their optimism level to avoid disappointment (Shepperd, Ouellette, & Fernandez, 1996; van Dijk, Zeelenberg, & van der Pligt, 2003; Kopalle & Lehman, 2000), but how optimism changes upon receiving feedback is under-studied. A general introduction of framing effects was presented in this section followed by how some of the framing effects (information in relative or absolute terms) could affect decision making (Malenka, Baron, Johansen, Wahrenberger, & Ross, 1993). I therefore suspect optimism could also be influenced by the framing of information. Optimism is also associated with certain individuals' personality trails and other demographical differences. In this chapter I will further explore such relationships with financial optimism measures using controlled experiments to attempt to isolate factors that affect financial optimism.

6.3. Research Hypotheses

Literature in section 2.3 and section 6.2 show that optimism is not completely innate, so the question is raised on what and how external factors could alter one's financial optimism bias. Research showed anticipating feedback reduces optimism (Carroll, Sweeny, & Shepperd, 2006; Kirkebøen & Teigen, 2010), and feedback affects forecasting confidence for some individuals (Eberlein, Ludwig, & Nafziger, 2010). However, there is little research on how optimism is changed after receiving feedback. I suspect that once feedback is received, individuals will shift their optimism bias. Hypothesis 1 deals with whether subjects' financial optimism levels are correlated with feedback of the immediate historical performance of the subjects' investment.

Hypothesis 1: Feedback of the result of past investment decisions changes one's financial optimism.

If feedback does shift optimism levels, then what is the direction of such shift? In other words, whether positive feedback always leads to increased optimism and negative feedback reduces optimism. My intuition is that the direction of change in optimism is somehow uncertain. It might depend on how information or feedback itself is presented in the experiment. Previously published literature showed framing of information or situations affects decision making, especially economic decision making (Tversky & Kahneman, 1981; Malenka, Baron, Johansen, Wahrenberger, & Ross, 1993; Schmitz & Ziebarth, 2011; Glaser, Weber, Langer, & Reynders, 2007). In particular, whether numerical information is given to participants in absolute or relative terms has different impacts on people's choices (Malenka, Baron, Johansen, Wahrenberger, & Ross, 1993). There is no existing research on whether financial optimism is affected by alternatively framed forecasting scenarios. So Hypothesis 2 is proposed as follows.

Hypothesis 2: Framing of forecasting scenarios affects an investor's financial optimism.

While the research findings in chapter 4 and 5 were presented at a number of conferences, one question repeated came up. That is whether optimism is related to personality traits. I found that in the BHPS most individuals change their optimism level across the years (see Appendix 8). When I selected people who were interviewed for all 17 years (N = 4,294) I found that only 47 people did not change their optimism level throughout 17 years of the interview period. However, the reason why these people maintain their optimism level is unclear. Even among people who changed their optimism level in the BHPS, whether optimism is associated with their personality differences at some degree is not clear. Personality traits have been found to relate to general optimism in forecasting (Eroglu & Croxton, 2010), but no previous research has studied whether financial optimism is associated with certain personality traits as well. Hypothesis 3 investigates whether such individual differences in personality correlate with financial optimism.

Hypothesis 3: Financial optimism is correlated with certain personality traits.

A further question was raised in a conference I attended was whether the measured optimism in my previous research completely overlaps with investor's risk attitude. Puri & Robinson (2007) found general optimism is significantly correlated with risk tolerance but the correlation is only around 15%. I study optimism within the financial decision making domain, therefore it would be interesting to further investigate this issue. I suspect financial optimism cannot be replaced or explained by risk attitude towards investment, but the correlations might be stronger than Puri & Robinson (2007) found. The BHPS does not contain questions asking about participants' risk attitude, risk attitude has to be measured outside the BHPS. I use a questionnaire to measure individuals' attitude on risk tolerance in this chapter. Hypothesis 4 investigates the relationship of risk tolerance with financial optimism.

Hypothesis 4: Optimism is positively associated with risk tolerance.

6.4. Data and Methodology

This section introduces my experiments and their development rationale, as well as the methodology of data analysis. I first discuss in section 6.4.1 why I choose to use controlled experiments as my research method and the advantages of controlled experiments compared to field studies in resolving the specific research questions in this chapter. Section 6.4.2 introduces the experiment design and procedures. It outlines in detail what tasks are involved in my experiments, the purpose and limitations of my experiment settings, the reason for providing incentives, feedback from trial experiments and other related issues. Section 6.4.3 shows how data is collected and cleaned. Section 6.4.4 defines financial optimism in the experiments by implementing the theoretical framework on optimism measures proposed in chapter 2. This is followed by definitions on the properties of portfolios in Section 6.4.5. Regression models are presented in section 6.4.6.

6.4.1. BHPS versus Experiments

This section aims at explaining why the experiment methodology was changed from survey-based analysis used in chapters 3, 4 and 5 to conducting controlled experiments in this chapter. Such alteration is partially to do with the purpose of the study in this chapter, partly due to the limitation of using survey data. Details are discussed in the following paragraphs.

Firstly, the purpose of this research is to study the effect of feedback, framing of information, personality traits and risk attitude on financial optimism. In my previous research on optimism in chapters 3, 4, and 5, I used the data from BHPS which does not contain questions on personalities, feedback on each investment and attitude towards risk. It is also not possible to examine framing effects using the BHPS as the survey was not structured for this specific study.

Therefore I must design my own experiment to include questionnaires to collect data on these variables and test my hypotheses proposed in section 6.3.

The second reason of conducting experiments lies in the generic advantages of conducting controlled experiments compared to using survey data. The BHPS collects information on participants once every year. Because of such infrequent interview/survey occurrences, information on the participants might be lost. More importantly, private information that the participants use when they answer the BHPS interview/survey questions are not known to us. These unknown factors are used by subjects to make financial expectations and other financial decisions related to the BHPS. Since I do not know these factors (such as the subject losing their job, or partner getting sick) it is not possible for me to find the theoretical rational choice for the subject, and without knowing the rational choice it is not possible for me to compute the exact optimistic bias using the BHPS data.

My BHPS measures of financial optimism are based on aggregated information- aggregated over several years. A lot of granularity of subjects' financial decisions was lost in the aggregated BHPS data and some of the aggregated data may no longer be appropriate for my study. For example, the subjects are asked for details about their investment portfolio only every five years. A recession could have occurred and recovery taken place within this five year period, and none of this will be revealed in the aggregated BHPS data. Therefore asking subjects whether they are financially better off or worse off in the BHPS study has reduced applicability for my optimism research because the subjects may be answering the question using a different information time frame (they just lost their job last week) than what is revealed to me in the BHPS data (every five years' aggregated data).

Furthermore, aggregated BHPS data means I don't know details about relevant previous data, especially on participants' investment performance. When the subjects answer the BHPS

question is he or she basing better off/worse off judgements on yesterday's, last week's or last year's performance? I don't know these answers. There are so many factors (from the general economic environment to an individual's relationship with her families) that affect financial optimism in the BHPS. In theory with a controlled experiment participants do not need to use these factors to make a virtual financial decision, and the historical performance of the investment and all the relevant information subjects have when making decisions are known to the experimenter.

The BHPS data cannot be used to formulate a true controlled experiment, because in a controlled experiment the independent variables are the only factors that are allowed to be adjusted, with the dependent variable as the factor that the independent variables will affect. In this chapter, I hope to find out how participants' optimism level changes within a controlled experimental environment in which I know all the relevant information subjects have and subjects only need to use the information I provide them to make their investment decisions. Therefore since I know nearly all the factors associated with the subjects' financial decisions I can study what affects financial optimism and whether these causes provide any practical implications on investment decision making.

I also understand that although the experimental method is in principal more appropriate to use in investigating the research hypotheses in the chapter due to the above advantages of controlled experiments, the design of the experiments is very crucial to ensure such "controlled" setting is effective. In section 6.4.2, I will discuss in details how these important experimental settings are designed to meet the requirements of a controlled environment.

6.4.2. Experiment Design and Procedures

This section discusses the details and the rationale of designing my experiments. The

experiment contains three parts: the participants are required to fill up a questionnaire on general demographics, and then they need to take part in an eight step portfolio allocation task, followed by a 120 item personality test.

6.4.2.1. Questionnaire on Demographics

In the experiments, participants are asked to fill out a questionnaire which collects information on their demographics, including their risk attitude on investment. Demographic questions include asking participants of their age, gender, degree information and wealth level, expectation on future income, etc shown as follows.

Name

Email address (optional)

Institution: Select your institution

Sex: Male Female

Age:

When selecting your country, please indicate the country to which you feel you belong the most, whether by virtue of citizenship, length of residence, place of birth or cultural affiliation.

Country: Select your country

How wealthy do you consider yourself compared to your peers (others in your home country).

Wealth level:	Very Low	Low	Below Average	Average	Above Average	High	Very High

Your expected annual income when you graduate compared to your peers (others in the country you work in).

Income when you graduate:	Very Low	Low	Below Average	Average	Above Average	High	Very High

How wealthy do you think you will be 10 years after you graduate compared to your peers (others your age in the country you live in).

	Very Low	Low	Below Average	Average	Above Average	High	Very High
Wealth level in 10 years:	○	○	○	○	○	○	◉

How much financial risk are you willing to take in an investment scenario? Higher risk taking behaviour can lead to higher returns but also more losses. Lower risk taking behaviour can lead to lower returns with less chance of loss.

	Very Low	Relatively Low	Average	Relatively High	Very High
Risk tolerance:	○	○	○	○	○

	Yes	No
Do you have any knowledge of finance theory?	○	○

The reason that income or wealth related questions are asked in scales instead of absolute numbers is because I am more interested in measuring subjects' attitude towards earnings than the absolute level of their earning expectation. One controversy of asking questions in scales is that subjects might understand the scales from different perspectives. For example, if the expectation for annual income after graduation is £30,000 for a few subjects, some might consider £30,000 is as "below average" while some others might perceive it as "high" compared to their peers. However, by using scale questions, it is easier for subjects to truthfully answer questions on their parents' wealth level and their expectation on salary in ten years' time by simply choosing scales than filling in absolute numbers. Some subjects might not know how much wealth their parents exactly have. Scales can also avoid the problem of inflation effects on income in the future as well as a country or currency effect on the income level. Moreover, it is more important for me to measure the effects of subjects' perceptions of how rich or poor they are than how much wealth they actually have so that I can find out whether being optimistic in earning expectation is related to optimism in investment decision making.

I ask subjects of their attitude towards taking financial risks in five scales from "very low" to

"very high". This design is similar to the question on individuals' risk tolerance in Puri and Robinson (2007) which used data from the Survey of Consumer Finances (SCF)[1].

6.4.2.2. Portfolio Allocation Task

In the seminal work Security Analysis (Graham & Dodd, 2004), the authors tried to separate investment decisions from speculation when he says "An investment operation is one which, upon thorough analysis, promises safety of principal and an adequate return. Operations not meeting these requirements are speculative". However, in the real-world investors don't have all the information they need to make a rational investment decision so they might resort to speculation to fill in the information asymmetry. By trying to design the experiment properly, I largely avoid this problem in my controlled experiment. By explicitly encapsulating all information for an investment decision in my experiment setting, it is possible to remove all rational need for speculation and make it the perfect investment task to isolate irrational financial optimism bias.

In the experiments, I attempt to exclude all confounding factors from the portfolio allocation task besides optimism, feedback on returns, framing, personality and demographics, and portfolio risks. The extraneous factors that I want to eliminate include effects of assets names and types, trend in historical returns and correlation between assets, etc. These confounding factors are normally presented in a real world investment decision, however it is possible to attempt to remove or reduce them in a controlled experiment. I discuss these biases and reasons why I hope to eliminate them in the following paragraphs.

[1] The question in surveying risk attitude in the SCF is "If you are an investor, how much financial risk are you willing to take? Take substantial risk for great reward. Take above average risk to earn above average returns. Take medium risk to earn average returns. Not willing to take any financial risks."

I do understand however despite my efforts to eliminate confounding factors in theory, in reality there are always other factors I did not consider which may be present in the experiment environment. The logic of the experiments is that these unthought-of elements are assumed to be randomly normally distributed therefore have no overall influence on my results. I am also aware that by excluding confounding factors, I increase the artificiality of the experiments and denied respondents' access to knowledge they would normally use to make a decision in reality. However, this is a general criticism or problem affecting all experiments conducted in controlled environments. The detailed design of my experiments is presented in the following sections.

a) Two Experiments

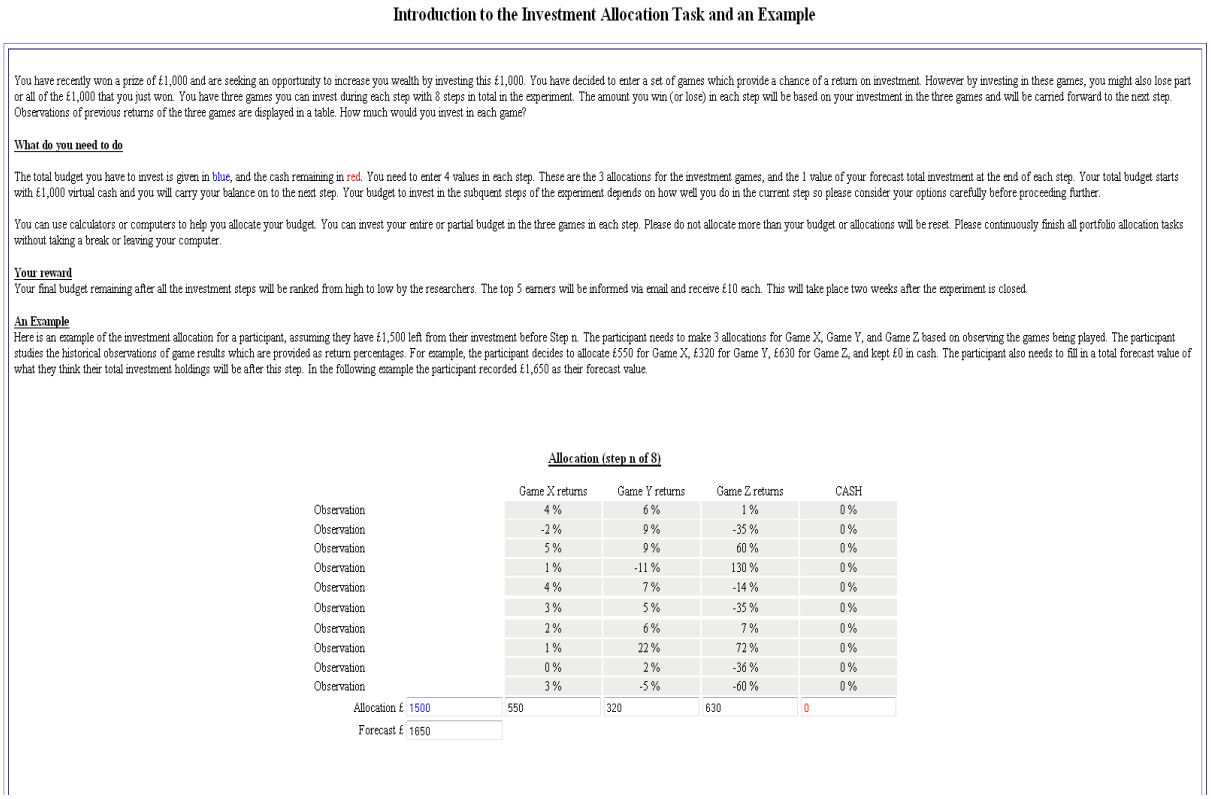
In my experiments, subjects are asked to make a number of decisions on investment allocation tasks (with 8 steps). The budget that is available to invest is dependent on the result of the previous steps. Participants were given a scenario that they have just won a prize of £1,000[1] and are seeking investment opportunities. They start with an initial virtual fund of £1,000 in Step 1. After each task, the balance from the previous task is carried on to the next task and the participants only have what they have left from the previous task to invest in the next one. If a participant loses all the virtual money at any step of the experiment, he will no longer be able to invest in sequent steps. Participants are not prohibited from using calculators and computers to help them make decisions.

The subjects are required to make a forecast on the return of the portfolio for each step. They are asked to make decisions on how much they would like to invest in each asset of the

[1] I provide a windfall income scenario to encourage investment as for example a saving scenario is more likely to bias people to keep money in cash (the non-risky option).

portfolios. I designed two experiments in order to find out whether asking forecast portfolio return in different forms (absolute portfolio values versus portfolio return in percentages) would result in different findings. Feedback of investment performance is given in both absolute value and percentage forms in both experiments. The only difference between the two experiments is that Experiment 1 asks participants to forecast their new portfolio total in absolute values in the investment allocation tasks while Experiment 2 asks participants to forecast their portfolio return in percentages in the tasks (see Figure 6 and Figure 7 for the user interface for Experiment 1 and Experiment 2 respectively).

Figure 6 User interface for Experiment 1



Introduction to the Investment Allocation Task and an Example

You have recently won a prize of £1,000 and are seeking an opportunity to increase you wealth by investing this £1,000. You have decided to enter a set of games which provide a chance of a return on investment. However by investing in these games, you might also lose part or all of the £1,000 that you just won. You have three games you can invest during each step with 8 steps in total in the experiment. The amount you win (or lose) in each step will be based on your investment in the three games and will be carried forward to the next step. Observations of previous returns of the three games are displayed in a table. How much would you invest in each game?

What do you need to do

The total budget you have to invest is given in blue, and the cash remaining in red. You need to enter 4 values in each step. These are the 3 allocations for the investment games, and the 1 value of your forecast total investment at the end of each step. Your total budget starts with £1,000 virtual cash and you will carry your balance on to the next step. Your budget to invest in the subquent steps of the experiment depends on how well you do in the current step so please consider your options carefully before proceeding further.

You can use calculators or computers to help you allocate your budget. You can invest your entire or partial budget in the three games in each step. Please do not allocate more than your budget or allocations will be reset. Please continuously finish all portfolio allocation tasks without taking a break or leaving your computer.

Your reward

Your final budget remaining after all the investment steps will be ranked from high to low by the researchers. The top 5 earners will be informed via email and receive £10 each. This will take place two weeks after the experiment is closed.

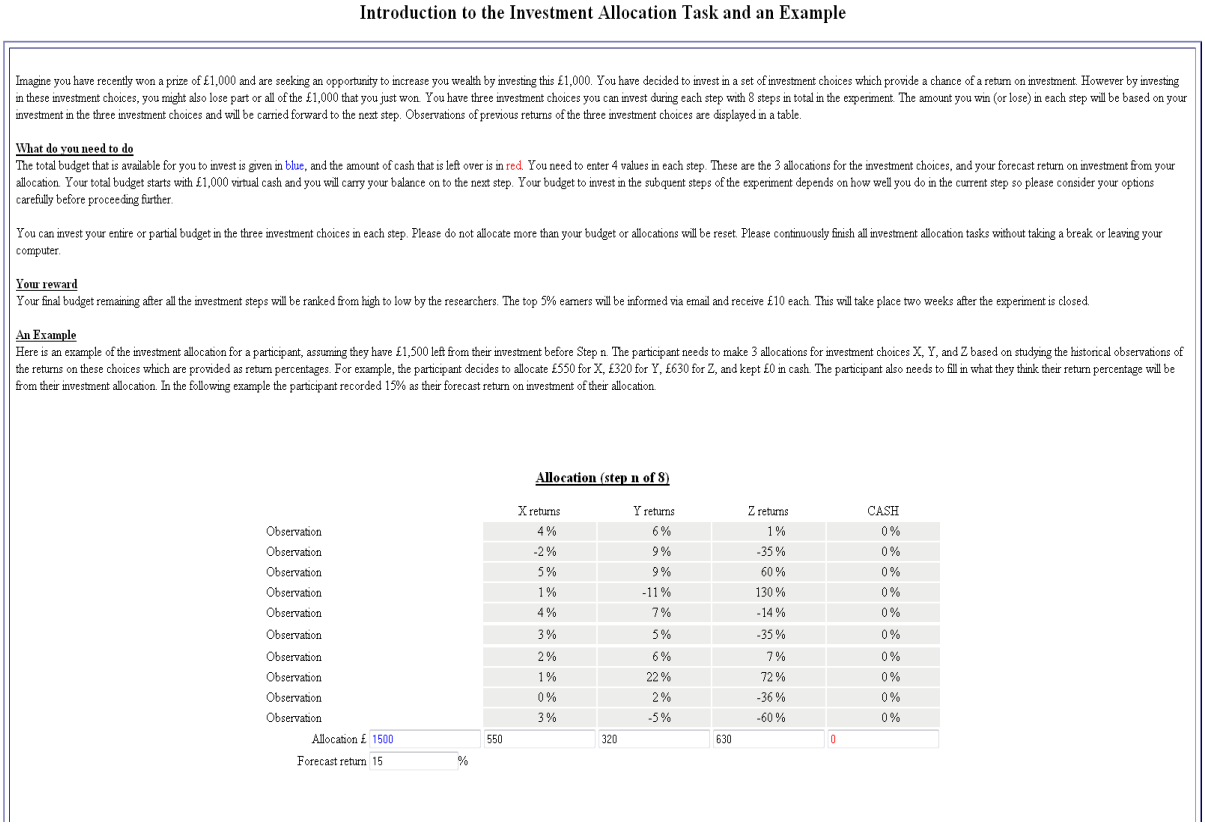
An Example

Here is an example of the investment allocation for a participant, assuming they have £1,500 left from their investment before Step n. The participant needs to make 3 allocations for Game X, Game Y, and Game Z based on observing the games being played. The participant studies the historical observations of game results which are provided as return percentages. For example, the participant decides to allocate £550 for Game X, £320 for Game Y, £630 for Game Z, and kept £0 in cash. The participant also needs to fill in a total forecast value of what they think their total investment holdings will be after this step. In the following example the participant recorded £1,650 as their forecast value.

Allocation (step n of 8)

	Game X returns	Game Y returns	Game Z returns	CASH
Observation	4 %	6 %	1 %	0 %
Observation	-2 %	9 %	-35 %	0 %
Observation	5 %	9 %	60 %	0 %
Observation	1 %	-11 %	130 %	0 %
Observation	4 %	7 %	-14 %	0 %
Observation	3 %	5 %	-35 %	0 %
Observation	2 %	6 %	7 %	0 %
Observation	1 %	22 %	72 %	0 %
Observation	0 %	2 %	-36 %	0 %
Observation	3 %	-5 %	-60 %	0 %
Allocation £ 1500	550	320	630	0
Forecast £ 1650				

Figure 7 User interface for Experiment 2



Introduction to the Investment Allocation Task and an Example

Imagine you have recently won a prize of £1,000 and are seeking an opportunity to increase you wealth by investing this £1,000. You have decided to invest in a set of investment choices which provide a chance of a return on investment. However by investing in these investment choices, you might also lose part or all of the £1,000 that you just won. You have three investment choices you can invest during each step with 8 steps in total in the experiment. The amount you win (or lose) in each step will be based on your investment in the three investment choices and will be carried forward to the next step. Observations of previous returns of the three investment choices are displayed in a table.

What do you need to do

The total budget that is available for you to invest is given in blue, and the amount of cash that is left over is in red. You need to enter 4 values in each step. These are the 3 allocations for the investment choices, and your forecast return on investment from your allocation. Your total budget starts with £1,000 virtual cash and you will carry your balance on to the next step. Your budget to invest in the subquent steps of the experiment depends on how well you do in the current step so please consider your options carefully before proceeding further.

You can invest your entire or partial budget in the three investment choices in each step. Please do not allocate more than your budget or allocations will be reset. Please continuously finish all investment allocation tasks without taking a break or leaving your computer.

Your reward

Your final budget remaining after all the investment steps will be ranked from high to low by the researchers. The top 5% earners will be informed via email and receive £10 each. This will take place two weeks after the experiment is closed.

An Example

Here is an example of the investment allocation for a participant, assuming they have £1,500 left from their investment before Step n. The participant needs to make 3 allocations for investment choices X, Y, and Z based on studying the historical observations of the returns on these choices which are provided as return percentages. For example, the participant decides to allocate £550 for X, £320 for Y, £630 for Z, and kept £0 in cash. The participant also needs to fill in what they think their return percentage will be from their investment allocation. In the following example the participant recorded 15% as their forecast return on investment of their allocation.

Allocation (step n of 8)

	X returns	Y returns	Z returns	CASH
Observation	4 %	6 %	1 %	0 %
Observation	-2 %	9 %	-35 %	0 %
Observation	5 %	9 %	60 %	0 %
Observation	1 %	-11 %	130 %	0 %
Observation	4 %	7 %	-14 %	0 %
Observation	3 %	5 %	-35 %	0 %
Observation	2 %	6 %	7 %	0 %
Observation	1 %	22 %	72 %	0 %
Observation	0 %	2 %	-36 %	0 %
Observation	3 %	-5 %	-60 %	0 %
Allocation £ 1500	550	320	630	0

Forecast return 15 %

b) The Investment Choices

I simply call my investment assets “Investment choices” in the experiment user interface to exclude the effect of assets names and types. Using terms like "stocks" and "bonds" is a confounding factor that affects the results as already studied by Weber, Siebenmorgen and Weber (2005). According to Weber et al (2005), the names of assets as well as the identification of the asset type can have effects on investment choices. They found that investors overestimate return for stocks and underestimate returns for bonds. If I do not remove this confounding factor, the statistical significance of the variables I am concerned about would be reduced.

I avoid calling the investment choices as “stocks” or “bonds” because if I mention “portfolio”, “stocks” or “assets” in the experiment, subjects are more likely to make an investment decision

on trend or correlation estimation. By using a relatively neutral term like “investment choices”, biases to portfolio allocations caused by trend estimation, cross correlation and recency can be avoided or reduced as “investment choice” does not imply trend and correlations as strongly as “portfolio”, “stocks” or “assets” does. The need of eliminating trend and correlation effects is discussed in the next section.

The position of the assets (from left to right) within the user interface in each experiment step was also changed. For example the high return-high risk choice isn’t always placed on the right side of the experiment interface. This is to reduce the position bias (Payne, 1951) to the portfolio allocation task.

c) The Returns

I avoid using real world financial data because using a time series of observations of real world financial returns would create a trend confounding factor which I would want to eliminate if possible. Data is framed as historical observations of returns from normally distributed “investment choices” rather than historical observations of real or virtual assets to prevent experiment subjects from trend estimation (Bianchi, Boyle, & Hollingsworth, 1999), cross correlation estimation (Campbell, Lo, & MacKinlay, 1997), and recency (Ebbinghaus, 1913) from the historical time series. If investing in real assets, subjects will be naturally inclined to be biased toward more recent historical data as the recent data might be perceived to be more relevant. They will also try to interpret trends and investigate the correlations among assets. However, I want to remove all possible extraneous variables that influence the subject’s portfolio allocation and forecasting task so I can concentrate on isolating the causes of optimism in my research.

I use two intuitive examples to further explain the reasons why I want to eliminate the effects of

trend. First, investment choices would be very different with or without trend in the data. For example, the attractiveness of an asset with historical returns of -30, -10, and 10 would be very different with or without the presence of trend. With trend, it's very likely this asset will have a gain of over 10. Without trend, this asset might be quite unattractive as there were heavy losses in the past. Therefore, I want to reduce the bias in investment decisions caused by trend as I want to focus on the effects of my testing variables. Second, one would have to weigh the importance of trend when computing the rational expected returns therefore the rational expected returns would be affected if there is trend in the historical returns. For example, if the return time series for an asset is 1,2,3,4 the next rational expected value may be 5 depending on the weighting of trend, or 2.5 which is the mean in the forecasting algorithm if there is no need to weight a trend component. It's much easier for subjects to find a rational expected value without the presence of trend.

Empirical evidence shows that linearity tests and portfolio selections are sensitive to heteroscedasticity and autocorrelation (Granger & Teräsvirta, Modelling Nonlinear Economic Relationships, 1993; Lee, White, & Granger, 1993) and correlations among financial assets returns causes a downward bias of asset returns (Bianchi R. J., 2007). When I generate assets returns for the experiment, I make sure that the procedure removes such effect of heteroscedasticity and correlations among assets on portfolio choices. The historical returns I provide for each investment choice are randomly generated based on zero correlations and without trend. I generate ten observations of returns for three assets in each step and the properties of these three assets (mean and standard deviation) are different from each other but identical throughout all the steps.

All assets chosen in my tasks are nearly on the efficient frontier and historical returns are generated based on a normal distribution without trend components or random correlations among assets. Returns are generated using MATLAB to ensure the above statistical parameters

hold. When formulating the experiment, I am able to make it comply with Modern Portfolio Theory (MPT) even more than the stock market. My experiment fits most of the MPT assumptions (see Appendix 9 for details of MPT assumptions). Assets returns are normally distributed which is not the case with most real-world stocks. Expected means and standard deviations are available from the historical returns which are presented in the experiment. The correlations among assets are fixed[1] in my experiment but are continually changing in the real stock market especially during economic crisis. All investors have access to the same information at the same time and their actions do not influence returns of the investment choices in my experiment. Unlike the real market, there are no taxes or transaction costs in the experiment. Subjects can therefore use MPT to find the rational efficient portfolio choice (on the efficient frontier) at different portfolio risk tolerances. MPT works better for this portfolio allocation task than for the stock market as most MPT assumptions are valid under my experiment setting but not in the real stock market. All information is explicit in my experiment but it is impossible to find the future expected returns for a real stock.

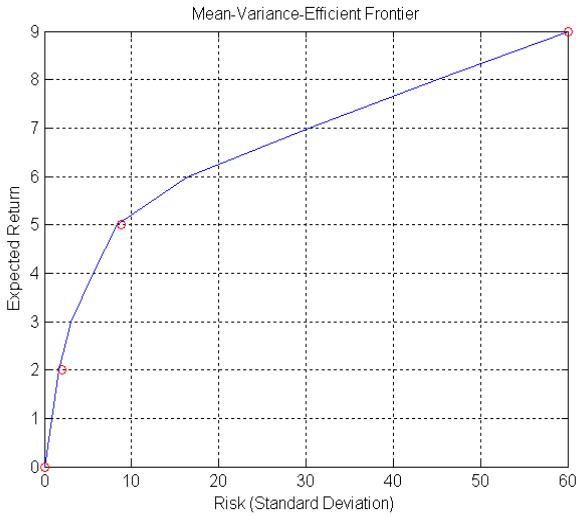
In the experiment, participants are given information on ten normally distributed historical observations of returns for each asset. I chose a high return - high risk asset (mean = 9, standard deviation = 60), a medium return - medium risk asset (mean = 5, standard deviation = 9), and a low return - low risk asset (mean = 2, standard deviation = 2) to formulate each step of this experiment. The individual asset returns and standard deviations (risks) were chosen such that a 100% complete portfolio allocation to any single asset is almost a perfectly rational investment that lies approximately[2] on the efficient frontier. This is an unbiased way of selecting high, medium and low risk/return assets such that all were equally (nearly) efficient rational options[3]

[1] Correlations are fixed at zero among the assets in my experiments when generating returns. Note that the apparent correlation in the sample will be a sample bias.
[2] The assets in my experiment are approximately on the efficient frontier. However, it is theoretically not possible for all assets (besides the asset with the most and asset with the least risk-return) to be all on the efficient frontier, because slightly more efficient portfolios can be constructed by diversifying with other assets.
[3] I define rational portfolio allocation as the allocated portfolio is on the efficient frontier.

(although with very different characteristics/observations). For example, the four red circles in Figure 8 represent four randomly generated assets (with one asset being the cash option) approximately on the efficient frontier (the blue curve) for the above means (low to high) and standard deviations (low to high).

Figure 8 Returns on investment choices in the Experiments

This figure shows the expected returns (means) and risks (standard deviations) of investment choices within each portfolio allocation step. The vertical axis represents expected returns (means) and the lateral axis represents the risks (standard deviations) associated with investments. The blue line represents the efficient frontier for the given asset means and standard deviations. The four red circles stand for the four investment choices for each step, which comprise a cash option with return and risk of zero, a low return - low risk asset (mean = 2, standard deviation = 2), a medium return - medium risk asset (mean = 5, standard deviation = 9), and a high return - high risk asset (mean = 9, standard deviation = 60).



The importance for the assets to be equally (nearly) efficient is that if the risk/return properties of the assets are selected randomly, some assets then can be more efficient than others because they generate a better return for a given level of risk. Under my settings where all assets are equally (nearly) efficient, participants' allocation should only be based on their risk/return preferences and not be affected by the differences in efficiency of the assets. In other words, I minimized the effects of differences in efficiency of assets on participants' portfolio choice. Although the subjects can choose to invest in only one asset in an experiment step, they have not diversified their investment which will not be the best option available to them as

diversification could provide them with portfolios that are perfectly on the efficient frontier. Also, they may lose heavily in the one asset they invest in. Since there are three assets being played in parallel in each step, it is better to allocate across the assets with an allocation according to the subject's risk/return preference.

I generated the assets' returns using MATLAB such that the sample properties are the same as the population properties so the presented historical observations are an accurate representation of the assets' probabilities of return. Besides, such returns from independent normally distributed assets do not imply trend. I generate the actual returns of the assets for each step using Monte Carlo simulation based on their means and standard deviations.

d) The Incentives

I provided financial incentives to motivate participants to try to do well in the investment allocation task. The top 5% best performers of the portfolio allocation task in the experiment are rewarded with £10 each. However, this financial incentive is only used for UK based experiment subjects. My attempt to provide a financial reward to overseas subjects was discouraged by the overseas school governance due to administrative difficulties.

I try to give the subjects the potential of real financial gain as this would help to imitate the reality of investment. This is an investment task that requires intelligence and skill to consistently do well because subjects have to evaluate the risk/return characteristics of the normally distributed asset returns to come up with an allocation that maximizes the return from each experiment step. A financially intelligent subject is more likely to be able to mediate between the risk and return characteristics of each asset to construct a portfolio, although I do not expect subjects to make efficient allocations due to their limited computational abilities and resources.

In my experiment, the returns of assets are random based on a normally distributed generating function and asset properties are completely described in the provided historical data. So while it is unlikely that any subjects will be able to manually find a perfectly efficient portfolio without conducting computational simulations using quadratic programming (Nocedal & Wright, 2006), using the provided information it is possible for a financially intelligent subject to allocate a portfolio that has a higher rational expected return and lower expected risk than a less financially intelligent subject. It is possible that the less intelligent subject gets 'lucky' but increasing the number of experiment steps and increasing the number of subjects will cause a statistically significant difference to form between financially intelligent and less-financially intelligent subjects' performance. Therefore, the more experiment steps there are, the more likely the financially intelligent subjects will do better than others for a given level of risk.

Studies have shown that providing a real financial reward to subjects causes them to be more careful when participating in experiments (Baltussen & Post, 2011). Baltussen and Post (2011) used an average reward per subject of €50 with a total experiment budget of over € 5,000. I am trying to simulate real financial decision making in this task with the possibility of real financial gain. This will create a more realistic experiment for testing optimistic bias (of forecast performance) in financial decision making. I understand that the monetary incentives I provide have different utility functions. For example, if providing £50 as financial incentive the utility of £50 to a banker and a student will indeed to be different. The student may be more careful and risk averse in her portfolio choice. Since the experiment subjects will all be students, confounding factors because of biases in the utility of the reward will be minimised.

However, I do understand that the utility of different reward structures will change the subjects risk/return preference in the experiment. This is an important part of the scenario or story behind the experiment. Giving the subject with the best performance £50 may create different

risk taking behaviour to if I give £5 to the top ten performers in class of 50 students. In my reward structures, I rank the experiment subjects according to their final remaining portfolio total and reward the top 5% earners with £10 to each. By using this reward structure, I encourage subjects to work hard in order to get into the top 5% of highest earners while they need to be reasonably cautious not to be too risk taking and lose too much. Overall, in my experiments while the provided monetary incentive is small at least it's a real financial gain. I received numerous emails from students enquiring about further details of the financial rewards before they participated in the experiments, which shows even a small financial reward stirs up interest and may lead to subjects making more effort to successfully complete the experiment.

e) Feedback and Initial Observations from Trial Experiments

Before launching my two experiments to subjects, I conducted two sets of trial experiments to obtain user feedback on the experiment interface and gather some initial data. 11 participants, among whom 5 participants have a finance related background took part in the trial experiment. 7 participants went through both versions of the experiment therefore 9 sets of data were collected in each experiment.

The trial feedback from the users was generally positive as they were able to understand the task and follow instructions. However, there is no universal agreement on which version of the experiment is better according the users. When asked which version of the experiment they prefer or feel easier to follow, different users have different opinions. Some thought "forecasting absolute value of the portfolio returns is more intuitive and suitable for people do not have a finance background", but some others think forecasting a return percentage is more meaningful as the historical returns of the investment choices are given in percentages and when they make investment decisions they often set a target of return percentages for themselves. Some users even changed their preferences regarding what is better - they initially thought forecasting a

return percentage is better but later decide they would actually prefer to do the value forecasting tasks. Another interesting phenomenon is almost all 7 people who did both versions think the second version that they were given is better. In other words, participants who were given Experiment 1 first and Experiment 2 afterwards think Experiment 2 is better, while people who were given Experiment 2 first but Experiment 1 later think Experiment 1 is a better option. It seems trial subjects favour the second version of the experiment they were given. This is perhaps due to their becoming familiar with the tasks and therefore finding their second experiment easy to understand. They might also assume that the second experiment is an "improved" version of the experiment therefore naturally they perceived it as a better designed version. In the actual controlled experiments, participants are randomly dived into two groups and each group takes part in only one version of the experiment. This is to ensure the no participant takes both experiments.

The initial data collected through the trial experiments also provides me some interesting preliminary observations. From the Experiment 1 pilot, I found that among the 9 participants in the trial, no one in a single step in the investment allocation task forecast his/her portfolio return below £1,000 (the starting budget for all participants) even when he/she has less than £1,000 left to invest after a few investment steps. Therefore I suspect that by asking participants to forecast absolute values (similar to their portfolio total), participants' forecasts are bounded by the value of the starting budget. In other words, no one prefers to believe that he/she is going to end up with a budget less than what they started with initially. Participants might be bounded by the initial budget when they forecast their portfolio total, or they might have some sort of preference for values in absolute terms due to utility functions. Asking participants to forecast a percentage increase might help participants avoid such biases towards the initial budget or absolute values. I suspect forecasting in percentages will make subjects more responsive to feedback and negative feedback might reduce optimism in expectations. On the other hand, when asked to forecast in percentages in the Experiment 2 pilot, no participants forecast a loss

(negative returns) on their investment. In this case, their judgments seem to be bounded by only forecasting above zero percentage numbers.

6.4.2.3. Personality Test

BHPS contains questions measuring participants' subjective well-being and participants' answers vary across the years depend on their circumstances. I am looking for a more stable way to measure one's personality, such as the five factor model of personality (FFM) which measures openness, conscientiousness, extraversion, agreeableness and neuroticism of a person. I found isolated items such as "depressed" in the BHPS that is similar to "often feel blue" in the item pool of the FFM. Unlike "depressed" as an independent question in the BHPS, "often feel blue" together with other questions/measures form the score for Neuroticism in the FFM personality test. The advantage of using a few questions to measure a personality is that I can avoid measuring a temporary feeling that changes over time, "depressed" in this case, but measure more persistent characteristics. In the FFM personality test, "often feel blue", together with items such as "get angry easily" and "experience my emotions intensely", look into negative emotions from various angles and form "neuroticism" as one of the five broad personalities.

Compared to other tests on personalities, the significant advance of the FFM was the establishment of a common taxonomy of personality traits in a previously unsystematic research field (Digman, 1990; Goldberg, 1993). The five factors were defined and scrutinised by several independent researchers and the domain of personality traits could be adequately described by the five factors though there were different opinions regarding the interpretation of these constructs (Digman, 1990). According to Goldberg (1993), the five factors in the FFM are described as follows, "Factor I - Extraversion which contrasts such traits as talkativeness, assertiveness and activity level with traits such as silence, passivity and reserve. Factor II -

Agreeableness that contrasts traits such as kindness, trust and warmth with such traits as hostility, selfishness and distrust. Factor III - Conscientiousness which contrasts such traits as organization, thoroughness and reliability with traits such as carelessness, negligence and unreliability. Factor IV - Neuroticism which includes such traits as nervousness, moodiness and temperamentality. Factor V - Openness to Experience that contrasts such traits as imagination, curiosity and creativity with traits such as shallowness and imperceptiveness".

I use the short version of the IPIP – NEO (International Personality Item Pool Representation of the NEO PI-R™[1]) to measure the five factors of personality. IPIP - NEO contains 120 items measuring Extraversion, Agreeableness, Conscientiousness, Neuroticism and Openness to Experience. In my experiments I also measured the scores for 30 facets for the five factors (each factor can break down into 6 facets). This procedure helps me to find out how financial optimism relates to the five factors in more details. The complete personality test is shown as follows.

Short version of the IPIP - NEO (used as the personality test in this thesis)

		Very Inaccurate	Moderately Inaccurate	Neither Accurate Nor Inaccurate	Moderately Accurate	Very Accurate
1.	Worry about things.					
2.	Make friends easily.					
3.	Have a vivid imagination.					
4.	Trust others.					
5.	Complete tasks successfully.					
6.	Get angry easily.					
7.	Love large parties.					
8.	Believe in the importance of art.					
9.	Use others for my own ends.					
10.	Like to tidy up.					
11.	Often feel blue.					
12.	Take charge.					
13.	Experience my emotions intensely.					
14.	Love to help others.					
15.	Keep my promises.					
16.	Find it difficult to approach others.					
17.	Am always busy.					
18.	Prefer variety to routine.					
19.	Love a good fight.					
20.	Work hard.					
21.	Go on binges.					

[1] NEO PI-R Represents for Neuroticism, Extraversion, Openness to Experience Personality Inventory - Revised

22.	Love excitement.					
23.	Love to read challenging material.					
24.	Believe that I am better than others.					
25.	Am always prepared.					
26.	Panic easily.					
27.	Radiate joy.					
28.	Tend to vote for liberal political candidates.					
29.	Sympathize with the homeless.					
30.	Jump into things without thinking.					
31.	Fear for the worst.					
32.	Feel comfortable around people.					
33.	Enjoy wild flights of fantasy.					
34.	Believe that others have good intentions.					
35.	Excel in what I do.					
36.	Get irritated easily.					
37.	Talk to a lot of different people at parties.					
38.	See beauty in things that others might not					
39.	Cheat to get ahead.					
40.	Often forget to put things back in their					
41.	Dislike myself.					
42.	Try to lead others.					
43.	Feel others' emotions.					
44.	Am concerned about others.					
45.	Tell the truth.					
46.	Am afraid to draw attention to myself.					
47.	Am always on the go.					
48.	Prefer to stick with things that I know.					
49.	Yell at people.					
50.	Do more than what's expected of me.					
51.	Rarely overindulge.					
52.	Seek adventure.					
53.	Avoid philosophical discussions.					
54.	Think highly of myself.					
55.	Carry out my plans.					
56.	Become overwhelmed by events.					
57.	Have a lot of fun.					
58.	Believe that there is no absolute right or					
59.	Feel sympathy for those who are worse off					
60.	Make rash decisions.					
61.	Am afraid of many things.					
62.	Avoid contacts with others.					
63.	Love to daydream.					
64.	Trust what people say.					
65.	Handle tasks smoothly.					
66.	Lose my temper.					
67.	Prefer to be alone.					
68.	Do not like poetry.					
69.	Take advantage of others.					
70.	Leave a mess in my room.					
71.	Am often down in the dumps.					
72.	Take control of things.					
73.	Rarely notice my emotional reactions.					
74.	Am indifferent to the feelings of others.					
75.	Break rules.					
76.	Only feel comfortable with friends.					
77.	Do a lot in my spare time.					
78.	Dislike changes.					
79.	Insult people.					
80.	Do just enough work to get by.					
81.	Easily resist temptations.					
82.	Enjoy being reckless.					
83.	Have difficulty understanding abstract					
84.	Have a high opinion of myself.					
85.	Waste my time.					
86.	Feel that I'm unable to deal with things.					
87.	Love life.					
88.	Tend to vote for conservative political					
89.	Am not interested in other people's					
90.	Rush into things.					
91.	Get stressed out easily.					
92.	Keep others at a distance.					
93.	Like to get lost in thought.					
94.	Distrust people.					
95.	Know how to get things done.					
96.	Am not easily annoyed.					
97.	Avoid crowds.					
98.	Do not enjoy going to art museums.					
99.	Obstruct others' plans.					
100.	Leave my belongings around.					

101.	Feel comfortable with myself.					
102.	Wait for others to lead the way.					
103.	Don't understand people who get emotional.					
104.	Take no time for others.					
105.	Break my promises.					
106.	Am not bothered by difficult social					
107.	Like to take it easy.					
108.	Am attached to conventional ways.					
109.	Get back at others.					
110.	Put little time and effort into my work.					
111.	Am able to control my cravings.					
112.	Act wild and crazy.					
113.	Am not interested in theoretical discussions.					
114.	Boast about my virtues.					
115.	Have difficulty starting tasks.					
116.	Remain calm under pressure.					
117.	Look at the bright side of life.					
118.	Believe that we should be tough on crime.					
119.	Try not to think about the needy.					
120.	Act without thinking.					

6.4.3. Data Collection and Cleaning

I use students as my experimental subjects. 200 students in total participated in the experiments. The participants include 165 students who are in their final year of education prior to college from the Shanghai Economic Management School, and 35 undergraduate students from the Psychology Department of City University London. Among the participants, 102 students participated in Experiment 1 and 98 students participated in Experiment 2.

Among the 200 experiment participants, data from 172 participants are used in my analysis. Invalid data due to participants' misunderstanding the task has been deleted from the data set. Among the 102 participants in Experiment 1, data from 8 participants who did not forecast returns in absolute values (but in percentages or only increased the value), and from 6 participants who entered invalid data have been deleted. Among the 98 participants in Experiment 2, data from 7 participants who did not forecast returns in percentages (but in absolute values or only increased the value), and from 7 participants who entered invalid data have been deleted. In total, 88 participants' data in Experiment 1 and 84 participants' data in Experiment 2 are analysed in my study.

6.4.4. Definitions of Financial Optimism

In my experiments, financial optimism is measured under the framework of *Financial expectation, A priori optimism,* and *A posteriori optimism* proposed in chapter 2. This is reflected using the same symbols in the formulae defining financial optimism throughout this thesis, irrespective of whether optimism scores are derived by using survey-based or experimental data.

Compared to the derived optimism scores using BHPS data in chapter 3, 4, and 5, the uniqueness of the definitions of financial optimism in experiments is that I do not measure optimism by asking questions or obtain self reported optimism scores as in many previous experimental studies (Weinstein, 1980; Anderson & Galinsky, 2006), but I find individual's optimism level by asking them to complete a particular set of tasks. I measure optimism in a precise financial decision making domain. The details of financial optimism definitions in the experiments are presented in the following sections.

6.4.4.1. Financial Expectation

In my experiments, I ask participants to make a forecast on their portfolio return after they make allocations (A_i) to available assets. I use the direct answers of the forecast, denoted as $\mathbf{E_i}$, as my definition of *Financial expectation*.

6.4.4.2. A Priori Optimism

In the context of my experiments, as all the information for participants to make investment

decisions is encapsulated in the experiment and is known to me in theory, *A priori optimism* is defined as the difference between a subject's forecast (E_i) of her portfolio return and the rational expected return of the portfolio (C_i^-) calculated based on Modern Portfolio Theory (MPT)

The following formula is used to define *A priori optimism* (O_i^-) within each portfolio allocation (A_i), where E_i is the forecasted return that the participant expects after allocating A_i, and C_i^- is the rational expected returns for A_i. *i* indicates a single step of the portfolio allocation task.

$$\mathbf{O_i^- = E_i - C_i^-} \qquad \text{Equation 20}$$

Where C_i^- is calculated as follows. μ_f is the mean returns for asset$_f$ and A_i is the allocation that participants made in asset$_f$ in experiment step *i*. *n* is the number of assets within each step.

$$\mathbf{C_i^- = \sum_{f=1}^{n} \mu_f A_{i,f}} \qquad \text{Equation 21}$$

As all the relevant information needed for participants to make investment decisions is provided and encapsulated in the controlled experiment and is known to us, *A priori optimism* is considered as "irrational optimism" in theory. But I am cautious in labelling *A priori optimism* as irrational optimism because behaviour which may seem to be irrational behaviour or judgments in an artificial environment may be rational and well justified in a real life situation (Ayton & Wright, 1994). People are not suited to deal with uncertainty using single event probabilities, such as in completing experiment tasks, but can make right judgments on uncertainty with frequencies with events in reality (Gigerenzer, 1994). Besides, there might also

be flaws that I am not aware of in designing the experiment preventing participants making rational judgments as discussed at the beginning of section 6.4.2.2.

6.4.4.3. A Posteriori Optimism

In my experiments, *A posteriori optimism* is defined as the difference between a subject's forecast (E_i) of her portfolio return and the realised returns of the portfolio.

In this chapter, I use the following formula to define *A posteriori optimism* (O_i^+) within each portfolio allocation (A_i), where E_i is the forecasted return that participants made after allocating A_i, and C_i^+ is the realised returns for A_i.

$$\mathbf{O_i^+ = E_i - C_i^+} \qquad \text{Equation 22}$$

Where C_i^+ is the actual return for an allocation A_i, and is generated using Monte Carlo simulation of the asset means and standard deviations. With *A posteriori optimism*, although I use realisation as approximation for the theoretical rational expected value, I am aware of that what happens in reality is often not rational. *A posteriori optimism* can be interpreted as errors in forecasting.

6.4.5. Definitions of Portfolio Returns, Portfolio Risks, and Inefficiency in Portfolio Allocation

Return of a portfolio ($RPtf_i$) is defined as follows, where $VPtf_i$ is the portfolio total after investing budget (Bgt_i) that is available for an individual to invest at the beginning of an experiment step.

$$\mathbf{RPtf}_{\boldsymbol{i}} = \mathbf{VPtf}_{\boldsymbol{i}} \,/\mathbf{Bgt}_{\boldsymbol{i}} - \mathbf{1} \qquad \text{Equation 23}$$

As the population correlations among assets are zero in my experiment, portfolio risk (PtfRisk_i) which is the standard deviation (or volatility) of the portfolio is defined as follows, where σ_f is the standard deviation for each asset in the allocation A_i.

$$\mathbf{PtfRisk}_{\boldsymbol{i}} = \sqrt{\sum_{\boldsymbol{f=1}}^{\mathbf{n}} (\boldsymbol{\sigma}_{\boldsymbol{f}} \, \mathbf{A}_{\boldsymbol{i,f}})} \qquad \text{Equation 24}$$

The inefficiency of a portfolio allocation is denoted as $InEf_i$. It is defined as follows, where REf_i represents the highest return that can be achieved from the optimal portfolio allocation with the same risk profile as the portfolio allocation (A_i) a participant made. C_i^- was defined in section 6.4.4.2.

$$\mathbf{InEf}_{\boldsymbol{i}} = \mathbf{REf}_{\boldsymbol{i}} - \mathbf{C}_{\mathbf{i}}^{-} \qquad \text{Equation 25}$$

I further illustrate my definitions of financial optimism and the inefficiency of portfolio allocation in Figure 9. I define inefficiency of the portfolio allocation (InEf_i) as the vertical distance from a portfolio allocation to the efficient frontier. All assets chosen in my tasks have parameters that are extremely close to or are on the efficient frontier (blue line) and the four red circles represent four assets (include cash remaining) in one step of the task. The green dot A_i is assumed to be an allocation by a subject in one step with an equal allocation (25%) to all three assets and the cash option. Point C_i^- on the vertical Expected Return axis is the rational expected return for A_i. The vertical distance between A_i to the efficient frontier is defined as inefficiency of the portfolio allocation. This is because for the same level of risk (standard

deviation) of A_i, higher returns can be achieved on the efficient frontier with optimal portfolio allocation. There is no advantage in allocating away from the efficient frontier so the distance to the frontier from the portfolio choice is the inefficiency of A_i. I suggest that the *A priori optimism* I find in this experiment is also irrational in theory because I have all the information needed to find the subject's rational financial decision before the task is completed. Hence there is no unknown confounding factor to support subjects being optimistic. However I understand that there might be other factors that I am not aware of in designing the experiment which prevent participants making a rational forecast, therefore while *A priori optimism* might be perceived as irrational in theory might not be so in reality.

Figure 9 Definitions of optimism and inefficiency in the portfolio allocation

This figure shows the expected returns (means) and risks (standard deviations) of all of the investment choices (four red circles) within each portfolio allocation step. The vertical axis represents investment expected returns (means) and the lateral axis represents the risks (standard deviations) associated with investments. The blue line represents the efficient frontier given means and standard deviations. The green dot A_i represents a portfolio allocation with 25% fund invested in all four investment choices. REf_i is the highest return can be achieved if the allocation was made on the efficient frontier with the same risk level of allocation A_i. C_i^- is the rational expected return defined in section 6.4.4.2. InEf_i is the inefficiency of allocation A_i.

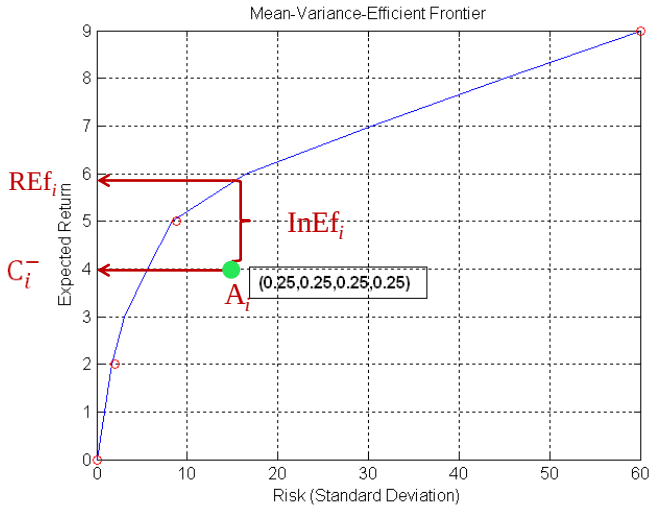


Figure 9 shows a subject may be rational in their expectations of returns ($O_i^- = 0$ or $\mathrm{E}_i = \mathrm{C}_i^-$) of their portfolio choice but inefficient in their actual portfolio allocation (the

portfolio allocation is away from efficient frontier, or $\mathrm{InEf}_i \neq 0$). Vice versa, the subject may be theoretically irrational in their expectation of returns ($O_i^- \neq 0$ or $\mathrm{E}_i \neq \mathrm{C}_i^-$) of their portfolio but efficient in their portfolio allocation as the allocation is on the efficient frontier ($\mathrm{InEf}_i = 0$).

I have to mention at this point that testing whether subjects can make efficient portfolio allocations is not the aim of my experiment because subjects may not have sufficient computational ability for achieving an efficient allocation. Rather the focus of my portfolio allocation task is to see whether and how optimistic/pessimistic expectations on the return of the portfolio allocation are affected by feedback, framing, personality and risk attitude.

6.4.6. Regression Models

I assume that the financial optimism and predictive factors are linearly correlated and use the OLS regression method introduced in chapter 4. I estimate the following equations with data on relevant variables collected in the experiments.

First I analyse the following equations using Experiment 1 and Experiment 2 data respectively as these two experiments were framed differently with details discussed in section 6.4.2.2.

$$Optimism_i = \beta_0(PtfRisk_i) + \beta_1(RPtf_{i-1}) + \sum_{m=1}^{5} \beta_m \, Pers\,(Factor)_{i,m} + \sum_{j=1}^{7} \beta_j \, Demo_{i,j} \qquad \text{(Equation 26)}$$

Where $Optimism_i$ is replaced by E_i, O_i^-, and O_i^+ respectively in analysis. *i* represents an observation (portfolio allocation) in the panel. $PtfRisk_i$ is the risk of portfolio allocation A_i contains. $RPtf_{i-1}$ is the subject's portfolio return from the previous step's allocation A_{i-1}

and $Pers(Factor)_{i,m}$ refers to the five factors of personality traits (extraversion, agreeableness, conscientiousness, neuroticism, and openness). $Demo_{i,j}$ refers to gender, age, wealth, salary expectation, wealth expectation in 10 years, risk tolerance and knowledge of finance theory. These variables definitions are valid for the following equations as well.

Then instead of using five factors of the personality, in the following equation I replace $Pers(Factor)_{i,m}$ with $Pers(Facet)_{i,n}$ which contains the 30 facets of personality (friendliness, gregariousness, assertiveness, activity level, excitement-seeking, cheerfulness, trust, morality, altruism, cooperation, modesty, sympathy, self-efficacy, orderliness, dutifulness, achievement-striving, self-discipline, cautiousness, anxiety, anger, depression, self-consciousness, immoderation, vulnerability, imagination, artistic interests, emotionality, adventurousness, intellect and liberalism).

$$Optimism_i = \beta_0(RtfRisk_i) + \beta_1(RPtf_{i-1}) + \sum_{n=1}^{30} \beta_n Pers(Facet)_{i,n} + \sum_{j=1}^{7} \beta_j Demo_{i,j}$$

(Equation 27)

I combine data from Experiment 1 and Experiment 2, and add an independent variable ($Framing_i$) to indicate which experiment the data come from. This is to identify any effects of the framing of the experiments. The equations containing the ($Framing_i$) variable are as follows.

$$Optimism_i = \beta_0(RtfRisk_i) + \beta_1(RPtf_{i-1}) + \beta_2(Framing_i) + \sum_{m=1}^{5} \beta_m Pers(Factor)_{i,m} + \sum_{j=1}^{7} \beta_j Demo_{i,j}$$

(Equation 28)

$$Optimism_i = \beta_0(RtfRisk_i) + \beta_1(RPtf_{i-1}) + \beta_2(Framing_i) + \sum_{n=1}^{30} \beta_n\, Pers\,(Facet)_{i,n} + \sum_{j=1}^{7} \beta_j\, Demo_{i,j}$$

(Equation 29)

For Equation 27 and Equation 29, a variable selection linear model is applied in the regression analysis to eliminate random correlations found among a large number of variables. Variable selection is an important part of regression analysis when there are multiple redundant or highly correlated independent variables in the data.

I use a Stepwise linear regression algorithm in the SPSS. At each step of the Stepwise procedure, all entered variables are considered for removal and entry. For example, the first of two highly correlated variables may be entered into the regression using the stepwise procedure as a default or a specified entry rule, but its inclusion can block the second variable from entering. Stepwise works in a way that if both variables are highly correlated and considered to be theoretically important, i.e. the effect of both income and wealth on consumption, then it is likely that the procedure will first enter income to the regression model. Then other variables in the model will come in by selection. Wealth however, will likely be excluded from the regression.

I am aware that fully automated stepwise regression does not work well when there is high correlation between independent variables as it does not know which contributing variable to eliminate in the multiple regression steps. However, even with potentially collinear independent variables I had to use stepwise regression to reduce the large number of explanatory variables in my regression analysis.

6.5. Analysis and Findings

In this section, data collected from the experiments are analysed. I first provide descriptive statistics on variables for both experiments to get a general outlook of variable values in section 6.5.1. Mean comparisons are conduced to detect whether there are any significant differences in variables between the two experiments. In section 6.5.2, I plot the frequency distributions of several variables to observe how data is distributed. Regression analysis is carried out in section 6.5.3 to explore the correlations between financial optimism and a number of explanatory variables of interest including feedback, personality and risk attitude. The framing effect is also investigated at the end of the section.

6.5.1. Descriptive Statistics for Variables in the Experiment 1 & 2

The descriptive statistics on various variables in the experiments in this section provide a brief description of participants' profile and their portfolio choices. Table 56 and Table 57 show descriptive statistics of the relevant variables in Experiment 1 and Experiment 2 respectively. Table 58 compares these variables in Experiment 1 to Experiment 2 to identify if there are any significant differences of individuals and their portfolio allocations.

Table 56 Descriptive statistics on variables in Experiment 1

This table reports the mean, standard deviations, minimum values, maximum values and the number of observations of the variables measured in Experiment 1. The variables are grouped into Financial optimism, Personal Characteristics, Personality and Portfolio allocation.

	All Individuals (Experiment 1)				
	Mean	**Sdv**	**Min**	**Max**	**N (obs)**
Financial optimism					
Financial expectation	26.71	96.91	-100	1384	704
A priori optimism	21.52	97.00	-105	1379	704
A posteriori optimism	20.46	98.07	-115	1371	704
Personal characteristics					
Male	0.57	0.50	0	1	704
Age	18.03	2.29	17	34	704
Wealth	4.13	0.92	2	6	672
Salary expectation (compared to peers)	4.03	0.85	1	6	704
Wealth expectation in 10 years (compared to peers)	4.66	0.84	3	7	704
Risk tolerance	3.05	0.81	1	5	704
Knowledge of finance theory	0.32	0.47	0	1	704
Personality (five factors)					
Extraversion	38.13	18.24	0	92	704
Agreeableness	43.98	21.28	2	95	704
Conscientiousness	47.31	21.34	8	99	704
Neuroticism	50.92	21.65	5	99	704
Openness	26.94	19.04	1	94	704
Portfolio allocation					
Return on portfolio	6.25	20.61	-69	140	704
Allocation in high risk high return choice (ptg)	0.30	0.27	0	1	704
Allocation in medium risk medium return choice (ptg)	0.31	0.25	0	1	704
Allocation in low risk low return choice (ptg)	0.30	0.23	0	1	704
Allocation in cash (ptg)	0.10	0.19	0	1	704
Portfolio risk	19.07	15.08	0	60	702

In Table 56 the average scores for financial optimism, *A priori optimism*, and *A posteriori optimism* are 26.71, 21.52 and 20.46 respectively. This means on average participants forecast that their portfolio values increase by 26.71% (*Financial expectation*) after allocation. Participants forecast 21.52% (*A priori optimism*) more than the rational expected returns. Compared to realised returns after allocations, participants' forecast is 20.46% (*A posteriori optimism*) more on average.

57% participants in Experiment 1 are male and the average age is 18.03. The average answers for wealth and salary questions are between "Average" and "Above Average". In general, participants expect their wealth level to increase by about half of a scale (4.13 to 4.66). Not too

surprisingly, participants on average are willing to take a medium level of risk for medium returns (3.05 for risk tolerance) when making investment decisions. About one-third of the participants have knowledge in finance theory. The average actual portfolio return is 6.25%. They allocate about 30% of the investment budget to each of the three available assets in the experiment while leaving 10% in cash. The average portfolio risk (standard deviation of the portfolio) is 19.07.

Table 57 Descriptive statistics on variables in Experiment 2

This table reports the mean, standard deviations, minimum values, maximum values and the number of observations of the variables measured in Experiment 2. The variables are grouped into Financial optimism, Personal Characteristics, Personality and Portfolio allocation.

	All Individuals (Experiment 2)				
	Mean	**Sdv**	**Min**	**Max**	**N (obs)**
Financial optimism					
Financial expectation	19.90	27.26	-25	500	672
A priori optimism	15.12	27.17	-31	491	672
A posteriori optimism	13.00	30.84	-75	415	672
Personal characteristics					
Male	0.27	0.45	0	1	672
Age	18.21	1.95	17	27	672
Wealth	4.11	0.82	2	7	672
Salary expectation (compared to peers)	4.29	0.96	2	7	672
Wealth expectation in 10 years (compared to peers)	4.95	0.99	2	7	672
Risk tolerance	3.12	0.88	1	5	672
Knowledge of finance theory	0.38	0.49	0	1	672
Personality (five factors)					
Extraversion	40.57	21.78	1	96	672
Agreeableness	40.57	22.04	0	99	672
Conscientiousness	48.73	25.96	0	99	672
Neuroticism	45.52	20.62	0	91	672
Openness	30.05	22.60	1	85	672
Portfolio allocation					
Return on portfolio	6.90	18.50	-69	85	672
Allocation in high risk high return choice (ptg)	0.31	0.23	0	1	672
Allocation in medium risk medium return choice (ptg)	0.28	0.20	0	1	672
Allocation in low risk low return choice (ptg)	0.29	0.22	0	1	672
Allocation in cash (ptg)	0.12	0.21	0	1	672
Portfolio risk	19.16	13.26	0	60	672

In Table 57 the average scores for financial optimism, *A priori optimism*, and *A posteriori optimism* are 19.90, 15.12, and 13.00 respectively. This means on average participants forecast their portfolio values increase by 19.9% (*Financial expectation*) after allocation. Participants

forecast 15.12% (*A priori optimism*) more than their rational expected returns. Compared to the realised returns after allocations, participants' forecast is 13% (*A posteriori optimism*) more on average.

27% participants in Experiment 2 are male and the average age is 18.21. The average answers for wealth and salary questions are between "Average" and "Above Average". In general, participants expect their wealth level to increase by about three quarter of a scale (4.11 to 4.95). Participants on average are willing to take a just above average level of risk associated with a similar level of returns when making investment decisions. Half of the participants have knowledge of finance theory. The average actual portfolio return is 6.90%. They allocate 31% of their investment budget to the riskiest asset available in the experiment while leaving 12% in cash. The average portfolio risk (standard deviation of the portfolio) is 19.16.

The average values of financial optimism in Table 56 seem higher than in Table 57. Therefore I conducted a comparison of the key variables using student's *t*-test (Welch's *t*-test: unequal sample sizes and unequal variance). Results on the comparisons of financial optimism, individual differences and portfolio allocations between Experiment 1 (forecast values) and Experiment 2 (forecast returns) are displayed in

Table 58. I found that participants have significantly higher levels of financial optimism when forecasting portfolio values compared to forecasting returns. For all three measures of financial optimism, participants forecast around 6% higher portfolio returns in Experiment 1 than in Experiment 2. The differences are highly significant. However, whether such differences in optimism result from the different framing of forecasting scenarios or sample differences is not clear. There are also differences in the demographics and personal characteristics between the two experiment groups. There are more

Table 58 Comparisons between Experiment 1 & 2

This table reports the comparisons of means of variables in Experiment 1 and Experiment 2. The left column displays the variables including measures of financial optimism, personal characteristics, personality and portfolio allocation. The second column from left reports the mean of these variables in Experiment 1 and the third column reports the mean of these variables in Experiment 2. The fourth column shows the level of significance (*p*-values) of the mean comparisons.

	Comparisons of Means		
	Experiment 1 (forecast values)	**Experiment 2 (forecast returns)**	***p*-Value**
Financial optimism			
Financial expectation	26.71	19.90	0.04
A priori optimism	21.52	15.12	0.05
A posteriori optimism	20.46	13.00	0.03
Personal characteristics			
Male	0.57	0.27	0.00
Age	18.03	18.21	0.06
Wealth	4.13	4.11	0.31
Salary exp (to peers)	4.03	4.29	0.00
Wealth exp in 10 years (to peers)	4.66	4.95	0.00
Risk tolerance	3.05	3.12	0.05
Knowledge of finance theory	0.32	0.38	0.01
Personality (five factors)			
Extraversion	38.13	40.57	0.01
Agreeableness	43.98	40.57	0.00
Conscientiousness	47.31	48.73	0.13
Neuroticism	50.92	45.52	0.00
Openness	26.94	30.05	0.00
Portfolio allocation			
Return on portfolio	6.25	6.90	0.27
Allocation in high risk high return choice (ptg)	0.30	0.31	0.26
Allocation in medium risk medium return choice (ptg)	0.31	0.28	0.01
Allocation in low risk low return choice (ptg)	0.30	0.29	0.27
Allocation in cash (ptg)	0.10	0.12	0.01
Portfolio risk	19.07	19.16	0.46

males in Experiment 1 than in Experiment 2. Participants in Experiment 2 are slightly but statistically significantly older than in Experiment 1. Participants in Experiment 2 have a higher expectation for future salary and wealth level than in Experiment 1. They are also more likely to have finance related knowledge. In terms of personality, participants in Experiment 1 are less extravert and open than in Experiment 2, but more likely to agree with people and feel stressed (Neuroticism). Participants in Experiment 2 do not prefer investing in the medium risk medium return assets, but leave more money in cash compared to participants in Experiment 1. The risk

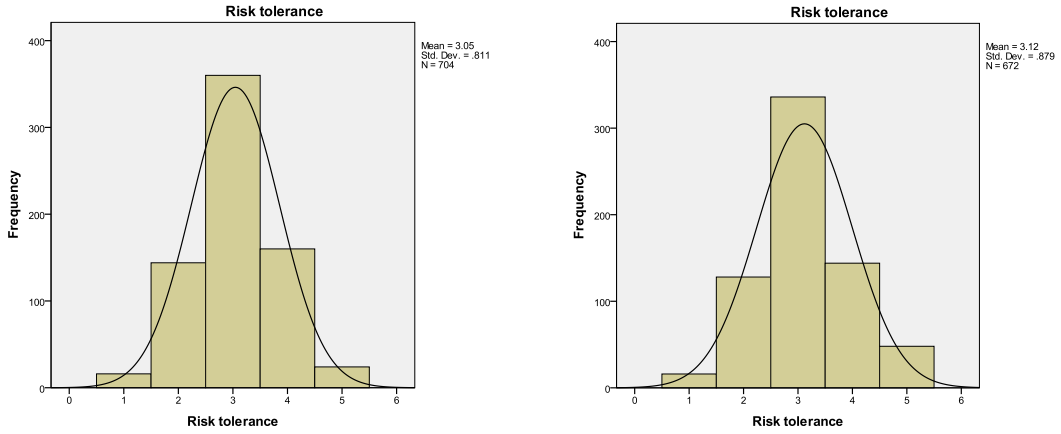
levels of the portfolios are not significantly different in Experiment 1 and Experiment 2.

6.5.2. Risk Attitude, Portfolio Returns, and Inefficiency in Portfolio Allocations

In this section, frequency distributions (plotted as histograms) on risk tolerance, portfolio returns and inefficiency in portfolio allocations are displayed for both experiments. The purpose of plotting the frequency distributions is to gather observed values of these variables into organised groups to show a general tendency of the data. Graphs are also used to provide an outlook of the data.

Figure 10 Frequency distributions on risk tolerance in Experiment 1 (left) and Experiment 2 (right)

This figure shows frequency distributions (plotted as histograms) on risk tolerance in Experiment 1 (left) and Experiment 2 (right). The histograms represent the frequency of the occurrences of a particular value range. Risk tolerance is measured by five-scale from "very low" to "very high". The lateral axis shows how data is grouped into these five scales. The vertical axis shows the frequency of the occurrences of each value.

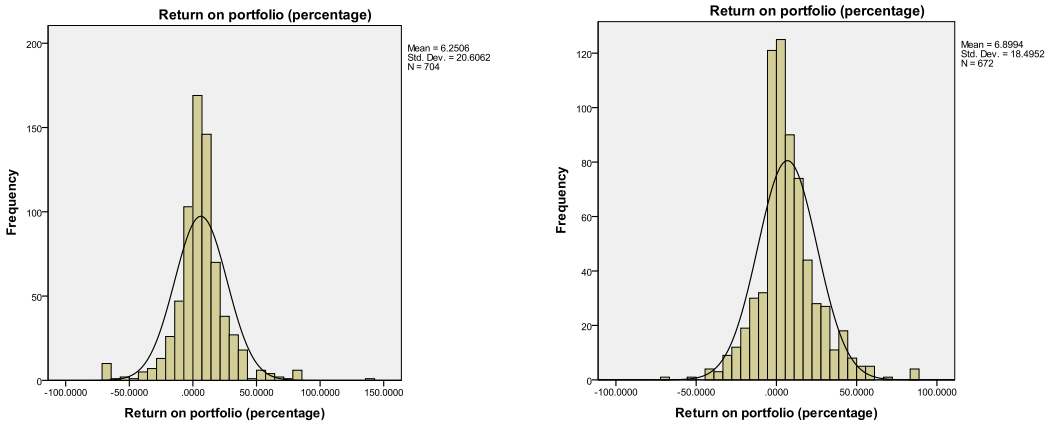


I first investigate how data on risk attitude is distributed in both experiments. In Figure 10, 51.1% of the people have a medium risk tolerance ("Average") in Experiment 1 compared to 50.0% in Experiment 2. In Experiment 1, 2.3% of the participants are highly risk averse, meaning they are only willing to take minimal level of risk for low return and loss. 3.4% of the participants are highly risk seeking, which means they would like to make highly risky

investments with the hope of achieving high returns. In Experiment 2, 2.4% of the subjects are highly risk averse and 7.1% of them are highly risk seeking. In both experiments, more people prefer "relative high" risks to "relative low" risks when it comes to investment. Note that the differences in risk attitude between Experiment 1 and 2 are not a result of the differences due to the design of the experiments, but a sample difference between the two groups of participants in the experiments.

Figure 11 Frequency distributions on portfolio returns in Experiment 1 (left) and Experiment 2 (right)

This figure shows frequency distributions (plotted as histograms) on returns on portfolios in Experiment 1 (left) and Experiment 2 (right). The histograms represent the frequency of the occurrences of a particular value range defined on the lateral axis. The vertical axis shows the frequency of the occurrences of each value.



I study the data on portfolio returns and found that, as indicated in Figure 11, 30.5% of the portfolio allocations result in losses in Experiment 1 compared to 34.5% in Experiment 2. More participants (31.7%) in Experiment 1 than in Experiment 2 (29.9%) achieved a return between 0 and 10%. People in Experiment 1 also seem to be more capable of achieving high returns than in Experiment 2 - 2.6% realised a gain greater than 50% compared to 2.1% in Experiment 2. However, only 0.3% had a loss of over 50% of their portfolio value in Experiment 2 while that figure is 1.8% in Experiment 1.

Now I move on to the issue of allocation inefficiency. As defined in section 6.4.5, inefficiency of portfolio allocation (InEf_i) is the vertical distance from a portfolio allocation to the efficient frontier, I plot all the portfolio allocations made by participants from both experiments in the following figures respectively to give a general idea of the investment performance of the participants in Figure 12. Then frequency distributions are provided for allocation inefficiency in Figure 13 to show the scale of such inefficiency in more detail.

Figure 12 Portfolio allocations in Experiment 1 (left) and Experiment 2 (right)

This figure shows how efficient the portfolio allocations made by participants are in Experiment 1 (left) and Experiment 2 (right). In either graph below, the vertical axis represents investment expected returns (means) and the lateral axis represents the risks (standard deviations) associated with investments. The blue line represents the efficient frontier given means and standard deviations of the available investment choices in the experiments. The red dots stand for all the portfolio allocations participants made.

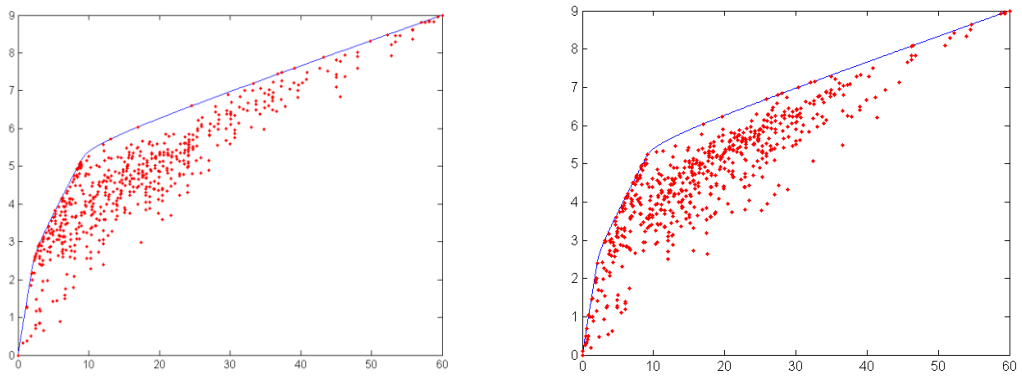


Figure 12 shows all the portfolio allocations made by participants in Experiment 1 (left) and Experiment 2 (right). Portfolio allocations the participants made are denoted by red dots in the figure while the efficient frontier is represented as a blue line. The dots approximately on the efficient frontier indicate that these allocations are nearly efficient. However, as shown in the figure, the vast majority of the allocations have deviated away from the efficient frontier, which means the allocations are inefficient.

Figure 13 Frequency distributions on inefficiency in allocations in Experiment 1 (left) and Experiment 2 (right)

This figure shows frequency distributions (plotted as histograms) on inefficiency in allocations in Experiment 1 (left) and Experiment 2 (right). The histograms represent the frequency of the occurrences of value ranges defined by the lateral axis. The vertical axis shows the frequency of the occurrences of such values.

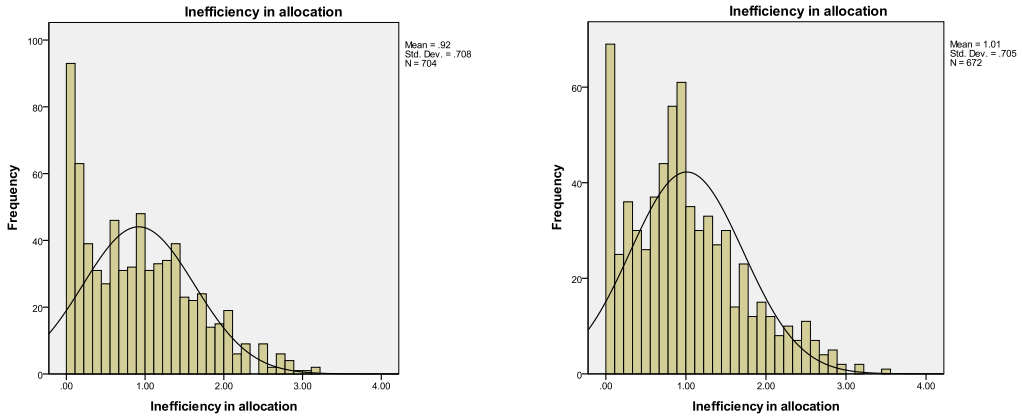


Figure 13 shows that 7.2% of the portfolio allocations are efficient in Experiment 1 compared to 6.8% in Experiment 2. 58.2% of the allocations in Experiment 1 and 56.4% in Experiment 2 fall between 0 and 1 in terms of the value of inefficiency. Experiment 2 sees 10.1% of the allocation with inefficiency values between 2 to 4, and the equivalent number in Experiment 1 is 8.5%.

6.5.3. Financial Optimism and Correlated Factors

This section explores whether and how factors such as feedback, framing, personality, risk attitude contribute to financial optimism. I run the regression models defined in section 6.4.6 with data collected from the two experiments separately.

6.5.3.1. Effects of Feedback, Personality and Risk Attitude on Financial Optimism in Experiment 1

This section displays regression results using data collected from Experiment 1 where participants are asked to forecast portfolio returns in absolute values.

Table 59 Optimism, feedback, personality (five factors) and risk attitude in Experiment 1

This table reports the regression results using Equation 26. Variables listed in the left column including demographics, risk attitude, five-factor personality and feedback are independent variables for the regression. Financial optimism in the first row is the dependent variable in the regression equation. Beta coefficients and the *p*-values associated with each coefficient are reported in the rest of the columns. Financial optimism is represented by *Financial expectation, A priori optimism* and *A posteriori optimism* respectively in the regression analysis. Coefficients and *p*-values reported respectively under each measure of financial optimism.

	Financial Optimism (Experiment 1)					
	Financial expectation		**A Priori Optimism**		**A Posteriori Optimism**	
	Beta	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**
Male	-0.033	0.451	-0.032	0.462	-0.038	0.384
Age	-0.056	0.184	-0.054	0.197	-0.053	0.203
Wealth	-0.207	0.000	-0.206	0.000	-0.211	0.000
Salary exp (to peers)	0.052	0.302	0.051	0.306	0.057	0.252
Wealth exp in 10 years (to peers)	0.002	0.973	0.003	0.954	0.005	0.931
Risk tolerance	0.084	0.063	0.084	0.062	0.085	0.058
Knowledge of finance theory	0.118	0.006	0.118	0.006	0.116	0.007
Extraversion	0.032	0.504	0.032	0.509	0.035	0.472
Agreeableness	-0.081	0.123	-0.079	0.136	-0.083	0.114
Conscientiousness	0.045	0.399	0.046	0.383	0.046	0.384
Neuroticism	-0.020	0.706	-0.019	0.721	-0.024	0.658
Openness	0.029	0.539	0.030	0.532	0.029	0.545
Portfolio return in last step	-0.195	0.000	-0.202	0.000	-0.216	0.000
Portfolio risk	0.009	0.828	-0.005	0.899	0.035	0.393
R Square	0.103		0.105		0.117	

As discussed in section 2.5, *Financial expectation* represents an individual's general positive outlook without a benchmark. Although *Financial expectation* is a straightforward measure, it might be oversimplified and might not reflect "true" optimism and the full decision making environment a respondent is in. *A priori optimism* and *A posteriori* optimism, on the other hand, improve the accuracy of measurement using a benchmark component compared to *Financial expectation.*

A priori optimism is calculated using information gathered before information about year *t* has

been exposed and it measures an individual's optimism level by using historical data as the 'rational expected value'. Although it does not reveal new information that people have at the time of forecasting which might justify their positive expectation for future in real life scenario, *A priori optimism* is a much more suitable optimism measure in controlled experiment studies as the experimenter provides all the information a participant needs to make a rational forecast. There is no hidden relevant information for the financial decision making process. Therefore *A priori optimism* can be considered as irrational optimism in theory in an experimental environment.

A posteriori optimism uses actual returns as benchmark values hence measures the 'forecasting errors' individuals make. Although what happened in reality is not always rational, an advantage of this measure is that problem of not knowing private information related to individuals' decision making is somewhat reduced as the realised financial return captures this information. *A posteriori optimism* represents irrational optimism or the effect of unexpected information exposed in year *t*in real life situations.

Regression results in Table 59 shows consistency between financial optimism and the independent variables across all three measures of financial optimism, which indicates the correlations between the investigated variables and different aspects of optimism measured by *Financial expectation*, *A priori optimism*, *A posteriori optimism* respectively are robust. Financial optimism is negatively correlated with current wealth level but positively correlated with risk tolerance and having knowledge of finance theory. The negative correlation between wealth level and financial optimism is consistent with my findings in previous research on optimism and individuals' portfolio choices in chapter 4 and 5. All my measures of financial optimism do not have significant correlation with the five factors of personality. When asked to forecast portfolio return in absolute values in Experiment 1, higher returns in the previous investment step (positive feedback) results in a lower financial optimism level in the following

step. This finding is supported by some previous studies on framing and expectation which found that asking for future price levels results in mean reverting expectations (De Bondt, 1991; O'Connor, Remus, & Griggs, 1997; Siebenmorgen & Weber, 2004).

Table 60 Optimism, feedback, personality (30 facets) and risk attitude in Experiment 1

This table reports the regression results using Equation 27. Variables listed in the left column including demographics, risk attitude, 30-facet personality and feedback are independent variables for the regression. Financial optimism in the first row is the dependent variable in the regression equation. Beta coefficients and the *p*-values associated with each coefficient are reported in the rest of the columns. Financial optimism is represented by *Financial expectation*, *A priori optimism* and *A posteriori optimism* respectively in the regression analysis. Coefficients and *p*-values reported respectively under each measure of financial optimism.

	Financial Optimism (Experiment 1)					
	Financial expectation		**A Priori Optimism**		**A Posteriori Optimism**	
	Beta	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**
Male	0.118	0.076	0.119	0.072	0.108	0.102
Age	-0.003	0.953	-0.002	0.979	-0.004	0.938
Wealth	-0.282	0.000	-0.281	0.000	-0.286	0.000
Salary exp (to peers)	0.103	0.113	0.104	0.108	0.116	0.071
Wealth exp in 10 years (to peers)	-0.016	0.809	-0.016	0.802	-0.018	0.780
Risk tolerance	0.096	0.062	0.096	0.060	0.093	0.069
Knowledge of finance theory	0.093	0.068	0.095	0.065	0.095	0.064
Friendliness	0.053	0.464	0.056	0.443	0.045	0.540
Gregariousness	-0.147	0.046	-0.151	0.040	-0.149	0.042
Assertiveness	0.203	0.006	0.205	0.006	0.204	0.006
Activity Level	-0.110	0.060	-0.108	0.064	-0.099	0.091
Excitement-Seeking	0.130	0.115	0.134	0.104	0.134	0.102
Cheerfulness	-0.120	0.126	-0.122	0.120	-0.116	0.137
Trust	0.049	0.443	0.048	0.444	0.052	0.411
Morality	0.052	0.594	0.058	0.553	0.063	0.515
Altruism	0.160	0.171	0.164	0.162	0.155	0.182
Cooperation	0.214	0.022	0.220	0.019	0.210	0.024
Modesty	-0.271	0.001	-0.272	0.001	-0.274	0.001
Sympathy	-0.006	0.923	-0.008	0.900	-0.004	0.949
Self-Efficacy	-0.223	0.010	-0.220	0.011	-0.219	0.011
Orderliness	-0.165	0.004	-0.165	0.004	-0.152	0.008
Dutifulness	0.012	0.883	0.015	0.860	0.007	0.931
Achievement-Striving	-0.062	0.411	-0.064	0.396	-0.063	0.401
Self-Discipline	0.022	0.764	0.022	0.766	0.029	0.689
Cautiousness	0.055	0.492	0.051	0.523	0.059	0.463
Anxiety	-0.089	0.261	-0.090	0.257	-0.099	0.212
Anger	0.102	0.136	0.102	0.138	0.097	0.153
Depression	0.057	0.397	0.055	0.411	0.062	0.352
Self-Consciousness	-0.063	0.414	-0.064	0.407	-0.073	0.342
Immoderation	-0.041	0.554	-0.040	0.566	-0.029	0.673
Vulnerability	0.066	0.463	0.072	0.425	0.068	0.450
Imagination	0.029	0.719	0.027	0.738	0.026	0.748
Artistic Interests	0.169	0.028	0.172	0.025	0.164	0.032
Emotionality	-0.132	0.139	-0.134	0.133	-0.133	0.134
Adventurousness	-0.151	0.027	-0.152	0.027	-0.159	0.020
Intellect	0.000	0.996	0.000	0.997	0.011	0.871
Liberalism	-0.184	0.001	-0.184	0.001	-0.180	0.001
Portfolio return in last step	-0.208	0.000	-0.216	0.000	-0.229	0.000
Portfolio risk	0.009	0.829	-0.004	0.920	0.036	0.394
R Square	0.201		0.202		0.209	

Regression equations used in Table 60 replace the five factors by the 30 facets as independent variables for personality measures. I found that although financial optimism does not correlate with the five factors of personality, it is significantly correlated with some of the facets. Financial optimism is negatively correlated with gregariousness, activity level, modesty, self-efficacy, orderliness, adventurousness and liberalism, but positively correlated with assertiveness, cooperation and artistic interests. Again, I found that financial optimism is negative correlated with current wealth level and the level of previous portfolio return but positively correlated with risk tolerance and having knowledge of finance theory.

Table 61 Optimism, feedback, personality (30 facets) and risk attitude in Experiment 1 (stepwise)

This table reports the regression results using Equation 27. Variables listed in the left column are independent variables selected by the "stepwise" procedure in SPSS for the regression. The importance of the independent variables in terms of their effects on the dependent variables is ranked from high to low in the left column. Financial optimism in the first row is the dependent variable in the regression equation. Beta coefficients and the *p*-values associated with each coefficient are reported in the rest of the columns. Financial optimism is represented by *Financial expectation*, *A priori optimism* and *A posteriori optimism* respectively in the regression analysis. Coefficients and *p*-values reported respectively under each measure of financial optimism.

	Financial Optimism (Experiment 1)					
	Financial expectation		**A Priori Optimism**		**A Posteriori Optimism**	
	Beta	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**
Portfolio return in last step	-0.204	0.000	-0.212	0.000	-0.226	0.000
Wealth	-0.181	0.000	-0.177	0.000	-0.187	0.000
Modesty	-0.145	0.001	-0.145	0.001	-0.146	0.001
Knowledge of finance theory	0.108	0.006	0.106	0.007	0.110	0.005
Cooperation	0.170	0.000	0.173	0.000	0.166	0.000
Morality	-0.116	0.012	-0.114	0.013	-0.110	0.016
Liberalism	-0.087	0.027	-0.087	0.027	-0.088	0.024
R Square	0.129		0.131		0.139	

Regression analysis for Table 61 also used 30 facets instead of the five factors as independent variables for personality measures. A large number of variables are analysed in Table 60 which may result in random correlations among variables, in Table 61 I used a variable selection linear model to avoid finding such random correlations among variables (see details in section 6.4.6). I found that although financial optimism is not correlated with the five factors of personality, it is

significantly correlated with some of the facets. Financial optimism is negatively correlated with modesty, morality and liberalism, but is positively correlated with cooperation. Financial optimism is also negative correlated with current wealth level but positively correlated with having knowledge of finance theory. Gain in the previous portfolio return is the biggest contributing factor for reduced financial optimism among the variables I investigated.

6.5.3.2. Effects of Feedback, Personality and Risk Attitude on Financial Optimism in Experiment 2

This section displays regression results by using data collected from Experiment 2 where participants are asked to forecast portfolio return in percentages.

Table 62 Optimism, feedback, personality (five factors) and risk attitude in Experiment 2

This table reports the regression results using Equation 26. Variables listed in the left column including demographics, risk attitude, five-factor personality and feedback are independent variables for the regression. Financial optimism in the first row is the dependent variable in the regression equation. Beta coefficients and the *p*-values associated with each coefficient are reported in the rest of the columns. Financial optimism is represented by *Financial expectation*, *A priori optimism* and *A posteriori optimism* respectively in the regression analysis. Coefficients and *p*-values reported respectively under each measure of financial optimism.

	Financial Optimism (Experiment 2)					
	Financial expectation		**A Priori Optimism**		**A Posteriori Optimism**	
	Beta	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**
Male	0.079	0.055	0.077	0.061	0.066	0.116
Age	-0.036	0.390	-0.035	0.415	-0.032	0.462
Wealth	0.108	0.017	0.106	0.019	0.094	0.041
Salary exp (to peers)	0.062	0.214	0.066	0.183	0.046	0.363
Wealth exp in 10 years (to peers)	-0.129	0.012	-0.132	0.011	-0.118	0.025
Risk tolerance	0.074	0.090	0.079	0.073	0.065	0.147
Knowledge of finance theory	-0.101	0.020	-0.107	0.015	-0.092	0.039
Extraversion	-0.102	0.031	-0.112	0.019	-0.083	0.086
Agreeableness	-0.047	0.275	-0.045	0.299	-0.046	0.296
Conscientiousness	0.002	0.972	0.004	0.940	-0.008	0.866
Neuroticism	0.009	0.839	0.009	0.843	-0.002	0.972
Openness	-0.043	0.379	-0.045	0.357	-0.024	0.627
Portfolio return in last step	0.081	0.032	0.080	0.034	-0.068	0.079
Portfolio risk	0.142	0.000	0.086	0.029	-0.026	0.512
R Square	0.084		0.072		0.043	

I found in Table 62 that financial optimism is positively correlated with being male and having

higher wealth levels, but is negatively correlated with wealth expectation in ten years' time and having knowledge of finance theory. Higher levels of risk tolerance lead to higher levels of financial optimism. Among personality traits, extraverts are less likely to be financially optimistic. Compared to results in Experiment 1, when asked to forecast portfolio returns in relative terms in Experiment 2, participants' optimism levels are increased with higher gains in previous steps (positive feedback). This finding is supported by previous research on framing and expectation which found that asking for percentage return forecasts leads to trend continuation (Shiller, 2000; Graham & Harvey, 2003). Optimists are also more likely to invest in riskier portfolios, which is consistent with my previous findings in chapter 4.

The five factors of personality in the regression equations used in Table 62 were replaced by the 30 facets as independent variables for personality measures in Table 63. I found that males are more likely to be financially optimistic. Wealth level is positively correlated with optimism while wealth expectation in ten years' time is negatively correlated with financial optimism. When I look into the relationship between financial optimism and personality facets, I found that optimism is negatively correlated with friendliness, altruism, vulnerability and adventurousness. When asked to forecast portfolio returns in relative terms in Experiment 2, a high portfolio return in the past results in increased levels of financial optimism. Financial optimism is also positively correlated with the riskiness of the portfolio.

Table 63 Optimism, feedback, personality (30 facets) and risk attitude in Experiment 2

This table reports the regression results using Equation 27. Variables listed in the left column including demographics, risk attitude, 30-facet personality and feedback are independent variables for the regression. Financial optimism in the first row is the dependent variable in the regression equation. Beta coefficients and the *p*-values associated with each coefficient are reported in the rest of the columns. Financial optimism is represented by *Financial expectation*, *A priori optimism* and *A posteriori optimism* respectively in the regression analysis. Coefficients and *p*-values reported respectively under each measure of financial optimism.

	Financial Optimism (Experiment 2)					
	Financial expectation		**A Priori Optimism**		**A Posteriori Optimism**	
	Beta	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**
Male	0.181	0.003	0.178	0.004	0.139	0.028
Age	-0.055	0.384	-0.051	0.430	-0.040	0.543
Wealth	0.134	0.011	0.133	0.012	0.111	0.042
Salary exp (to peers)	0.093	0.194	0.100	0.161	0.066	0.369
Wealth exp in 10 years (to peers)	-0.173	0.010	-0.178	0.009	-0.153	0.027
Risk tolerance	0.073	0.162	0.078	0.138	0.069	0.196
Knowledge of finance theory	-0.090	0.100	-0.097	0.079	-0.087	0.124
Friendliness	-0.144	0.050	-0.147	0.046	-0.126	0.095
Gregariousness	-0.016	0.838	-0.020	0.798	-0.011	0.890
Assertiveness	-0.140	0.059	-0.148	0.048	-0.119	0.120
Activity Level	-0.052	0.460	-0.053	0.452	-0.045	0.532
Excitement-Seeking	0.066	0.437	0.058	0.494	0.042	0.632
Cheerfulness	0.155	0.111	0.165	0.092	0.135	0.177
Trust	0.033	0.580	0.034	0.572	0.047	0.442
Morality	0.051	0.411	0.057	0.362	0.041	0.526
Altruism	-0.180	0.030	-0.187	0.025	-0.185	0.031
Cooperation	-0.044	0.530	-0.047	0.503	-0.013	0.853
Modesty	0.074	0.378	0.085	0.316	0.042	0.627
Sympathy	-0.092	0.173	-0.101	0.138	-0.064	0.356
Self-Efficacy	0.045	0.676	0.049	0.647	0.067	0.542
Orderliness	-0.053	0.544	-0.047	0.592	-0.034	0.707
Dutifulness	0.082	0.203	0.083	0.198	0.053	0.424
Achievement-Striving	0.118	0.265	0.114	0.285	0.113	0.299
Self-Discipline	-0.022	0.803	-0.011	0.895	-0.038	0.671
Cautiousness	0.027	0.747	0.020	0.818	0.012	0.893
Anxiety	-0.040	0.540	-0.041	0.532	-0.032	0.629
Anger	0.076	0.292	0.075	0.299	0.066	0.374
Depression	0.132	0.060	0.134	0.058	0.103	0.156
Self-Consciousness	0.028	0.685	0.031	0.656	0.021	0.764
Immoderation	0.019	0.800	0.022	0.762	0.015	0.838
Vulnerability	-0.156	0.072	-0.158	0.070	-0.131	0.143
Imagination	-0.088	0.234	-0.094	0.209	-0.066	0.386
Artistic Interests	0.050	0.422	0.056	0.370	0.053	0.410
Emotionality	-0.006	0.926	-0.006	0.931	-0.018	0.800
Adventurousness	-0.113	0.060	-0.116	0.055	-0.072	0.246
Intellect	-0.014	0.841	-0.017	0.797	-0.039	0.575
Liberalism	0.023	0.708	0.029	0.646	0.034	0.589
Portfolio return in last step	0.083	0.027	0.083	0.028	-0.063	0.105
Portfolio risk	0.153	0.000	0.097	0.017	-0.023	0.586
R Square	0.131		0.122		0.080	

Table 64 Optimism, feedback, personality (30 facets) and risk attitude in Experiment 2

(stepwise)

This table reports the regression results using Equation 27. Variables listed in the left column are independent variables selected by the "stepwise" procedure in SPSS for the regression. The importance of the independent variables in terms of their effects on the dependent variables is ranked from high to low in the left column. Financial optimism in the first row is the dependent variable in the regression equation. Beta coefficients and the *p*-values associated with each coefficient are reported in the rest of the columns. Financial optimism is represented by *Financial expectation*, *A priori optimism* and *A posteriori optimism* respectively in the regression analysis. Coefficients and *p*-values are reported respectively under each measure of financial optimism.

	Financial Optimism (Experiment 2)					
	Financial expectation		**A Priori Optimism**		**A Posteriori Optimism**	
	Beta	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**
Altruism	-0.098	0.024	-0.099	0.023	-0.128	0.002
Wealth	0.144	0.000	0.145	0.000	0.117	0.005
Wealth exp in 10 years (to peers)	-0.102	0.016	-0.103	0.015	-0.084	0.050
Portfolio risk	0.128	0.001	0.070	0.069		
Male	0.099	0.009	0.099	0.010		
Portfolio return in last step	0.085	0.023	0.085	0.025		
Friendliness	-0.091	0.029	-0.096	0.023		
R Square	0.084		0.071		0.030	

Again in

Table 64 I used a variable selection linear model to avoid the occurrence of random correlations among a large number of variables. I found that being male or wealthy increased financial optimism, but higher wealth expectation is related to lower financial optimism. When I look into the relationship between financial optimism and personality facets, I found that financial optimism is negatively correlated with altruism and friendliness. Optimism is also positively associated with the riskiness of the portfolio. Higher previous gain is associated with higher optimism levels.

6.5.4. Financial Optimism and Framing Effect

This section investigates whether framing of the experiment situation has any influence on financial optimism. The regression models defined in section 6.4.6 are applied using data collected from both experiments. The results are displayed in the following tables.

Table 65 Financial optimism and framing effect (personality: five factors)

This table reports the regression results using Equation 28. Variables listed in the left column including the identifier of the experiment, demographics, risk attitude, five-factor personality and feedback are independent variables for the regression. Financial optimism in the first row is the dependent variable in the regression equation. Beta coefficients and the *p*-values associated with each coefficient are reported in the rest of the columns. Financial optimism is represented by *Financial expectation*, *A priori optimism*, and *A posteriori optimism* respectively in the regression analysis. Coefficients and *p*-values reported respectively under each measure of financial optimism.

	Financial Optimism (Experiment 1 vs. 2)					
	Financial expectation		**A Priori Optimism**		**A Posteriori Optimism**	
	Beta	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**
Forecast values	0.042	0.163	0.039	0.194	0.068	0.022
Male	0.007	0.827	0.007	0.815	0.002	0.956
Age	-0.036	0.221	-0.035	0.238	-0.034	0.241
Wealth	-0.123	0.000	-0.123	0.000	-0.131	0.000
Salary exp (to peers)	0.063	0.073	0.063	0.073	0.064	0.065
Wealth exp in 10 years (to peers)	-0.034	0.341	-0.033	0.348	-0.026	0.452
Risk tolerance	0.040	0.188	0.040	0.185	0.037	0.212
Knowledge of finance theory	0.049	0.100	0.049	0.101	0.049	0.096
Extraversion	-0.012	0.713	-0.014	0.681	-0.009	0.778
Agreeableness	-0.040	0.223	-0.038	0.254	-0.042	0.197
Conscientiousness	0.030	0.401	0.031	0.386	0.027	0.455
Neuroticism	-0.023	0.493	-0.022	0.507	-0.029	0.373
Openness	-0.005	0.873	-0.006	0.855	-0.005	0.876
Portfolio return in last step	-0.118	0.000	-0.123	0.000	-0.162	0.000
Portfolio risk	0.059	0.041	0.038	0.185	0.043	0.130
R Square	0.042		0.040		0.056	

When I look at the comparisons of average values of financial optimism between Experiment 1 and Experiment 2 in

Table 58, there was a significant difference between financial optimism in the two experiments. However, it is not clear from the results in

Table 58 whether such difference in optimism is due to the framing of the two forecast situations or sample differences. Therefore, I combined the data from Experiment 1 and Experiment 2 and added a "framing" factor (Forecast values versus Forecast returns) as an independent variable to investigate whether framing of the experiments affects financial

optimism. I found in Table 65 that framing does not affect *Financial expectation* and *A priori optimism*, but forecasting in values increases *A posteriori optimism*. This indicates that when making forecasts in values, participants are more likely to make forecasting errors than when they forecast in relative terms. In the combined data, wealth level is negatively correlated with financial optimism, but salary expectation in ten years compared to peers is positively related to financial optimism. Positive feedback reduces financial optimism.

Table 66 Financial optimism and framing effect (personality: 30 facets)

This table reports the regression results using Equation 29. Variables listed in the left column including the identifier of the experiment, demographics, risk attitude, 30-facet personality and feedback are independent variables for the regression. Financial optimism in the first row is the dependent variable in the regression equation. Beta coefficients and the *p*-values associated with each coefficient are reported in the rest of the columns. Financial optimism is represented by *Financial expectation*, *A priori optimism*, and *A posteriori optimism* respectively in the regression analysis. Coefficients and *p*-values reported respectively under each measure of financial optimism.

	Financial Optimism (Experiment 1 vs. 2)					
	Financial expectation		**A Priori Optimism**		**A Posteriori Optimism**	
	Beta	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**
Forecast values	0.028	0.376	0.024	0.435	0.055	0.076
Male	0.065	0.087	0.065	0.087	0.056	0.142
Age	-0.015	0.674	-0.014	0.703	-0.016	0.657
Wealth	-0.125	0.000	-0.124	0.001	-0.134	0.000
Salary exp (to peers)	0.055	0.144	0.055	0.146	0.056	0.136
Wealth exp in 10 years (to peers)	-0.037	0.331	-0.037	0.331	-0.029	0.446
Risk tolerance	0.064	0.045	0.064	0.044	0.062	0.048
Knowledge of finance theory	0.045	0.170	0.045	0.165	0.045	0.163
Friendliness	0.033	0.475	0.034	0.462	0.028	0.536
Gregariousness	-0.056	0.210	-0.059	0.191	-0.047	0.288
Assertiveness	0.078	0.073	0.078	0.074	0.081	0.062
Activity Level	-0.063	0.080	-0.063	0.082	-0.058	0.107
Excitement-Seeking	0.052	0.233	0.052	0.229	0.050	0.245
Cheerfulness	0.001	0.979	0.002	0.976	0.007	0.892
Trust	-0.003	0.929	-0.003	0.939	0.002	0.962
Morality	-0.070	0.120	-0.067	0.136	-0.064	0.153
Altruism	0.023	0.700	0.022	0.715	0.013	0.825
Cooperation	0.168	0.000	0.167	0.000	0.162	0.000
Modesty	-0.137	0.002	-0.136	0.002	-0.132	0.002
Sympathy	0.011	0.766	0.012	0.753	0.016	0.664
Self-Efficacy	-0.122	0.020	-0.123	0.020	-0.116	0.027
Orderliness	-0.130	0.001	-0.130	0.001	-0.117	0.004
Dutifulness	0.059	0.190	0.060	0.183	0.050	0.261
Achievement-Striving	0.095	0.060	0.096	0.057	0.083	0.098
Self-Discipline	-0.083	0.066	-0.083	0.067	-0.084	0.059
Cautiousness	0.122	0.008	0.122	0.009	0.123	0.007
Anxiety	-0.067	0.105	-0.066	0.107	-0.071	0.083
Anger	0.087	0.047	0.085	0.053	0.081	0.063
Depression	0.088	0.043	0.087	0.044	0.085	0.049
Self-Consciousness	-0.014	0.714	-0.015	0.711	-0.013	0.747
Immoderation	-0.033	0.389	-0.033	0.390	-0.036	0.335
Vulnerability	0.007	0.884	0.010	0.847	0.008	0.879
Imagination	0.019	0.685	0.018	0.690	0.025	0.590
Artistic Interests	0.044	0.290	0.045	0.281	0.047	0.255

Emotionality	-0.055	0.229	-0.055	0.234	-0.056	0.225
Adventurousness	-0.071	0.058	-0.071	0.056	-0.068	0.065
Intellect	-0.031	0.425	-0.032	0.419	-0.035	0.368
Liberalism	-0.074	0.030	-0.074	0.031	-0.076	0.026
Portfolio return in last step	-0.121	0.000	-0.127	0.000	-0.165	0.000
Portfolio risk	0.055	0.056	0.035	0.227	0.039	0.173
R Square	0.090		0.089		0.101	

When I use 30 facets for personality traits instead of five factors as independent variables in Table 66, I still found that framing is significantly correlated with *A posteriori optimism*. This means participants are significantly more optimistic when they forecast portfolio returns in absolute values rather than in percentages. Forecasting in values again seems to increase forecasting errors. Among personality facets, financial optimism is positively correlated with assertiveness, cooperation, achievement thriving, cautiousness, anger and depression, but is negatively associated with activity level, modesty, self-efficacy, orderliness, self-discipline, adventurousness and liberalism. Positively feedback reduces financial optimism.

Table 67 Financial optimism and framing effect (personality: 30 facets; stepwise)

This table reports the regression results using Equation 27. Variables listed in the left column are independent variables selected by the "stepwise" procedure in SPSS for the regression. The importance of the independent variables in terms of their effects on the dependent variables is ranked from high to low in the left column. Financial optimism in the first row is the dependent variable in the regression equation. Beta coefficients and the *p*-values associated with each coefficient are reported in the rest of the columns. Financial optimism is represented by *Financial expectation*, *A priori optimism* and *A posteriori optimism* respectively in the regression analysis. Coefficients and *p*-values reported respectively under each measure of financial optimism.

	Financial Optimism (Experiment 1 vs. 2)					
	Financial expectation		**A Priori Optimism**		**A Posteriori Optimism**	
	Beta	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**
Portfolio return in last step	-0.120	0.000	-0.125	0.000	-0.162	0.000
Wealth	-0.123	0.000	-0.121	0.000	-0.128	0.000
Know finance theory	0.058	0.039	0.056	0.046	0.059	0.033
Modesty	-0.081	0.007	-0.080	0.008	-0.085	0.005
Cooperation	0.120	0.000	0.120	0.000	0.116	0.000
Morality	-0.085	0.007	-0.083	0.008	-0.080	0.010
Forecast values					0.061	0.027
R Square	0.045		0.046		0.062	

In Table 67, I found framing affects on *A posteriori optimism* which is consistent with my findings on financial optimism and framing effect in Table 65 and Table 66. When I use a variable selection model, framing is the sixth largest influencer for *A posteriori optimism*.

Feedback has the strongest effect on financial optimism. Modesty and morality is negatively associated with financial optimism while cooperation promotes optimism.

6.5.5. Summary

Section 6.5 analyses data collected from my experiments. Descriptive statistics and frequency distributions are provided for an insight into the variable values, followed by a regression analysis looking into the relationships between financial optimism and a number of investigated factors, such as feedback, personality, risk attitude and framing effect.

I found that financial optimism is positively correlated with risk tolerance for all the regression analysis in both experiments. In Experiment 1, positive feedback on previous portfolio returns significantly reduces financial optimism while it increases financial optimism in Experiment 2. When looking into the relationship between financial optimism and personality traits, I found that in Experiment 1 financial optimism is negatively correlated with modesty, morality and liberalism, but is positively correlated with cooperation. In Experiment 2, financial optimism is negatively correlated with extraversion, friendliness and altruism. I find framing affects financial optimism directly. Forecasting values instead of returns significantly increases the *A posteriori optimism* measure. This indicates that participants are more likely to make forecasting errors when they forecast in absolute values rather than in relative terms.

6.6. Conclusion

This chapter investigates whether and how feedback on investment performance, framing of situations, personality, and risk attitude influence financial optimism via controlled experiments. The overall finding is that financial optimism is associated with these factors. I used *Financial expectation*, *A priori optimism* and *A posteriori optimism* as the measures of financial optimism. Findings are discussed and conclusions reached in the following paragraphs of this section.

When exploring the relationship between financial optimism and feedback, I found people react to feedback of previous investment performance significantly differently in alternatively framed forecasting scenarios. My results show how people react to the previous portfolio returns depends on whether they are forecasting portfolio returns in absolute values or relative terms. In other words, by asking participants to answer questions differently (forecast portfolio return in absolute values versus forecast portfolio return in percentage terms), the effect of feedback on financial optimism varies.

In Experiment 1, within which participants forecast portfolio return in absolute values, positive feedback on previous portfolio returns reduces financial optimism while it increases financial optimism in Experiment 2, where participants forecast portfolio returns in relative terms. This confirms my belief that different experiment settings would lead people to make decisions on forecasting differently. I suspect the underlying reason for such differences is that when people consider their investment in absolute terms in Experiment 1, achieving a positive return makes them feel satisfied with the achieved absolute figures and such satisfaction with the previous return make them less "aggressive" in forecasting future returns to avoid potential disappointment. When the portfolio return is low in absolute values, people are not willing to adjust their expectation downwards accordingly as I found with my trial data. In Experiment 2

where people consider their investment in percentages, such effect of satisfaction or dissatisfaction with absolute investment values fades away and people are more aware of how well they actually did in the previous investment task. Therefore, they adjust their expectation accordingly with previous investment performance. A high return might be perceived as good performance or investment skill by the participants and such belief might increase their future optimism level. Subjects seem to have responded to feedback on previous portfolio returns in a more objective way in Experiment 2.

By combining data from Experiment 1 and Experiment 2 and adding a "framing" factor to the regression equations, I found that framing affects financial optimism directly. Forecasting values instead of returns significantly increases *A posteriori optimism* which is one of my financial optimism measures. This indicates forecasting values are more likely to lead to larger forecasting errors. My findings on financial optimism and framing is consistent with previous studies where asking for future price levels results in mean reverting expectations (De Bondt, 1991; O'Connor, Remus, & Griggs, 1997; Siebenmorgen & Weber, 2004), but asking for percentage return forecasts causes trend continuation (Shiller, 2000; Graham & Harvey, 2003).

I then look into whether financial optimism is related to certain personality traits. Results show that financial optimism does not correlate with a subject's five factors of personality in Experiment 1, but is significantly negatively correlated with Extraversion in Experiment 2. Among personality facets, financial optimism is negatively correlated with gregariousness, activity level, modesty, self-efficacy, orderliness, adventurousness and liberalism, but is positively correlated with assertiveness, cooperation and artistic interests in Experiment 1. When I used a variable selection model, financial optimism is negatively correlated with modesty, morality and liberalism, and is positively correlated with cooperation. In Experiment 2, financial optimism is negatively correlated with friendliness, altruism, vulnerability and adventurousness. Among these facets, altruism and friendliness have the largest correlations

with financial optimism.

The reason why certain dimensions of personality are correlated with financial optimism is beyond the scope of this thesis. The detailed reasons behind these correlations are not investigated further. My speculation is that different forecasting scenarios might affect the way subjects think and bring out various aspects of their personalities when they make financial decisions. Previous literature shows personality can affect people's decision making via their information processing style and mood-states (Eroglu & Croxton, 2010). Future work could investigate whether the relationship I found between personalities and optimism is robust by using a much larger sample size and samples that are more representative of the whole population, such as subjects from different age groups and occupations. Researchers can also select people of certain a personality, such as Extraverts, using a personality test and investigate whether these subjects are constantly making more/less optimistic forecasts in their investment compared to a control group.

Regarding the relationship between financial optimism and risk attitude, I found that financial optimism is positively correlated with an attitude on risk tolerance for all the regression analysis in both experiments. In Experiment 2, financial optimism is also significantly correlated with the risk-taking behaviour in making portfolio allocation decisions, which is consistent with my previous research findings in chapter 4. The regression results in Experiment 2 show that financial optimism increases riskiness in the portfolios. Although I found financial optimism is associated with attitude towards risks in Experiment 1, I did not find a significant relationship between optimism and the level of risk in portfolios in Experiment 1. This slight uncertainty in the relationship between optimism and risk-taking behaviour could be due to a statistically significant lower number of participants (32%) having knowledge of finance theory in Experiment 1 compared with 38% in Experiment 2. It is possible that fewer participants have the ability or financial knowledge to mediate between risk and returns, or they might not be able

to identify the level of risk of each investment choice in Experiment 1.

I believe findings in this chapter fill a longstanding void in the literature. Optimism within the financial decision making domain has never been studied in such a depth before. There was little research showing how financial optimism is altered after receiving feedback. There is very limited prior research comparing two forecasting scenarios within the same experiment design (Glaser, Weber, Langer, & Reynders, 2007). To my knowledge, research in this chapter is the first sturdy to investigate how framing affects financial optimism. Whether financial optimism is correlated with personalities including a detailed list of personality facets has never been studied before, and whether risk tolerance in investment is correlated with optimism in the same domain was unspecified.

The uniqueness of my definitions of optimism in the experiments is that I study optimism in a specific financial decision making domain, and I measure financial optimism by using observed data instead of self reported data. I this chapter, I do not measure optimism by asking questions to collect self-reported scores on optimism as in many previous experimental studies (Weinstein, 1980; Anderson & Galinsky, 2006), but I find individual's optimism level by asking them to make a number of investment decisions and forecast. By not using the self-reported data, I could avoid the situation where optimism measures can generate a score when the forecast is in fact not irrational due to participants' private information such as with the BHPS data I used in my previous analysis.

Using an controlled experiment approach also provided a remedy to the shortcomings of testing optimism with field data in the previous chapters. However, I am also aware that an artificial experiment setting sometimes affects the applicability of research results and conclusions to real life investing behaviour as the observed participants' behaviour or judgments in experiments might not happen the same way in reality. What may look like irrational or "wrong" behaviour

might be perfectly justified in a real world situation. Although I have tried my best to consider all the factors that might affect results in designing my experiment, I have to face the truth that experiments are often more or less flawed as there could always be neglected factors. However I believe that even given their limitations, controlled experiments have revealed a great deal about the factors affecting optimism in financial decision making. When conducting these controlled experimented I had to fund the experiments myself which means very limited financial incentives could be provided to the participants to simulate real investment behaviour. Future improvements of this experiment should aim at encouraging participants to make financial decisions that are more close to what they would do in reality.

Chapter 7

Conclusion

7.1. Introduction

Existing literature shows how optimism affects decision making in various social domains. Optimistic individuals believe their chances of experiencing a negative event is lower than average but that they are more likely to encounter positive events (Weinstein, 1980; Aucote & Gold, 2005). There are seminal studies on how optimism influences economic phenomena. Optimism has been proved to be closely associated with risk taking behaviour of financial or business professionals (Gervais, Heaton and Odean, 2002; Heaton, 2002; Hackbarth, 2007). It plays an important role in financial market movement and impacts on economic consumption (Lee, Shleifer, and Thaler, 1991; Barberis, Shleifer and Vishny 1998; Kacperczyk and Kominek, 2002). However, the role of optimism in household portfolio chocie within the financial decision making domain is not sufficiently studied. There is no conclusive answer to whether an individual investor would be better off being optimistic. It is also unclear that what factors are associated with financial optimism.

Studies carried out in this thesis fill these gaps in the published literature. I found that financial optimism has a positively correlation with individual investors' tendency of allocating higher portion of their wealth in riskier portfolios. Optimists are more likely to borrow unsecured personal debt. Optimists are on average younger, more educated, more likely to be male or self-employed than pessimists or neutral respondents. But at the same time there is a higher unemployment rate among optimists than non-optimists. However, the independent contribution of each factor, such as age, on optimism could not be studied as my data was from an uncontrolled survey. This means that variation in optimism entirely caused by a single variable, such as age, may not be isolated because of age's correlation with other demographics.

Although optimism appears to be associated with a lower level of wealth, optimism does benefit an individual by increasing her future objective well-being. The positive effect of financial optimism on objective well-being is fairly limited due to optimists often starting off with a worse financial situation. Optimism alone is unlikely to help advance an individial investor's overall wealth status. Optimism positively correlates with people's current subjective well-being, which may indicate that an optimistic state of mind helps people stay happy and satisfied with themselves but optimism's long-term impact on subjective well-being may be less favourable.

My findings help individual investors realise what potentially makes them optimistic or pessimistic. Receiving feedback is one of the factors that affects optimism, although how feedback works on optimism depends on how a financial forecasting task is framed. Positive feedback is likely to reduce optimism when forecasting in absolute values while it increases optimism when forecasting portfolio returns in relative terms. If the task is framed as forecasting in absolute values, then people are more prone to be optimistic. Financial optimism is correlated with certain personality traits, such as extraversion, altruism, modesty and morality. Therefore it is not completely within one's ability to choose to be or not to be optimistic. Financial optimism is demonstrated to be strongly positively correlated to one's attitude on risk tolerance.

The remaining sections in this chapter are arranged as follows. Section 7.2 reviews the contributions of this thesis. Section 7.3 discusses my finding in detail from each chapter. Seciton 7.4 provides an overall conclusion for this thesis and discusses implications. Section 7.5 points out the limitations of this study and proposes future work.

7.2. Contributions

This thesis contributes by filling several gaps in the published literature. There has been insufficient research on the role of optimism in household portfolio choice. The relationship between optimism and individuals' economic choices has never been studied using UK household data. No previous research has studied the correlations between optimism, objective well-being, and subjective well-being within the same study, which means it was not conclusive whether optimism is beneficial to one's well-being. If optimism and objective as well as subjective well-being are not studied using the same data set and methodology, implications on how optimism affects well-being might be subject to difference in research domains and methodologies. There is also a lack of field studies on the influence of optimism on well-being. There is little research illustrating how optimism is biased after receiving feedback as most previous literature focused on the stage of anticipating feedback. There are a very limited number of studies comparing differently framed forecasting scenarios on expectations within the same experiment design. To my knowledge, my research is the first to investigate how framing financial information as absolute or relative values affects optimism in a financial decision making domain. Testing whether financial optimism is related to a list of detailed personality facets has never been studied before, and how risk tolerance in investments is correlated with optimism in the same domain was unclear.

This thesis contributes to the research on optimism by using improved measures for optimism. I studied optimism within a specific domain, the financial decision making domain, attempting to fully capture the effect of financial optimism on a financial decision making. I suspect, for example in Puri & Robinson (2007), an individual's optimism in her life expectancy might remain relatively stable unless her health status changes. However, optimism in investments could be affected by the stock market volatility and the global or local economic cycle. Using

optimism related to a health situation might not fully capture the effect of financial optimistic bias in investment decisions. To investigate optimism more accurately, I believe it is necessary to study optimism within various life domains and decision making processes. I use a benchmark component as the rational expected values for two of my optimism measures, but in previously published research, optimism is mostly measured as a general positive outlook without a benchmark. The aim of using such rational benchmark value is to target the irrational optimistic bias of the financial decision. Although there is still a limitation on finding these theoretical rational values in uncontrolled real-world financial decision making domains, I believe the benchmark values used in my optimism measure are the closest approximates for rational expected values.

The strength of this thesis rooted largely in the utilisation of multiple research methodologies. As both field study and laboratory studies have their advantages and shortcomings, I use both methods to examine optimism so that one method compliments the other. While the BHPS provides a huge number of detailed real world data with thousands of respondents, it does not reveal all the information the respondents used to make their judgments. The data in the BHPS is collected annually, therefore a lot of information that a respondent used to form an answer to the questionnaires may be lost over the interview intervals. On the other hand, with controlled experiments, all relevant information that is available to the participants to form their financial decisions is known to me. Hence in theory I can single out and test the factors relating to optimism that bias rational decision making. In addition, by using controlled experiments, I can measure optimism by asking participants to make a number of investment decisions and forecast outcomes, instead of using the potentially biased self-reported scores in the BHPS. By doing this, I could avoid the general criticism of self-reported data. More importantly, I could prevent the problem of generating optimism scores when the forecast is in fact not "irrationally optimistic" due to participants' private information about a real-world uncontrolled financial decision making domain which is not revealed in surveys such the BHPS.

7.3. Findings and Discussion

In Chapter 2, I introduce the concept of optimism and its relevant aspects by reviewing the published literature. Optimism is found to have influences on various social phenomena. It affects people's perception of risks and therefore optimists often think they are invulnerable to negative life events (Weinstein, 1980). Optimism affects financial market movements and the rational decision making ability of financial professionals. Optimism can often be explained by the motivations of forecasters and their cognitive biases.

I point out the problems in measuring optimism in the literature. Optimism is often measured without specifying a particular social domain and without using a benchmark as the "rational expectation value". I propose a theoretical framework for measuring financial optimism in this thesis. *Financial expectation* measures investors' general outlook of their future financial situation. *A priori optimism* measures one's financial optimism level using historical return as a benchmark for the rational expected value. *A posteriori optimism* measures optimism in an individual's forecasts against the actual realised financial values. *Financial expectation*, *A priori optimism*, and *A posteriori optimism* are used for analysis in both the survey-based and the controlled experiment studies in this thesis.

Chapter 3 introduces the British Household Panel Survey (BHPS) data, from which variables are selected and analysed in my analysis. Scores for *Financial expectation*, *A priori optimism*, and *A posteriori optimism* are generated using the BHPS. The descriptive statistics and frequency distributions on optimism measures show there are more optimistic respondents than pessimistic respondents in this survey. I found the average values for respondents' demographics, wealth levels, and employment profiles.

Time trends of the variables indicate that financial optimism seems to coincide with financial market cycles. Personal debt and property prices have a substantial increase in the BHPS interview period across the 17 years while the unemployment rate is decreasing. People are more educated now than before. The correlations among optimism and demographic variables show optimism is significantly correlated with lower levels of savings and investment. There are positive relationships between savings and income, education and job security, health status and wealth.

Chapter 4 compares the profile of optimists, pessimists and neutral respondents in the BHPS and investigates the impact of financial optimism on household portfolio choices. Financial optimism exists widely amongst the younger population with lower wealth levels. Optimists are also more likely to male, self-employed, or unemployed than non-optimists.

Evidence from the regression analysis proves that financial optimism is positively correlated with individual investors' investment in riskier portfolios. It therefore may affect households' risk-taking behaviour in financial decision making in a similar way as business professionals. Optimistic individuals also borrow higher levels of unsecured debt and larger mortgages. The underlying reason for favouring risks in financial investment might be as indicated by Tennen and Affleck (1987) that optimism leads to the tendency of not worrying about the potential negative outcomes of a risky decision. My findings support Gollier's (2005) claim that a mental manipulation of beliefs led by positive thinking is likely to affect the asset allocation of an investor. Among the three measures of financial optimism, *A priori optimism* had the strongest correlation with household portfolio choice followed by *A posteriori optimism* and *Financial expectation.*

Chapter 5 finds complex relationships between financial optimism and well-being. *Financial expectation* is found to be positively correlated to current investment income and increase in

future income. *A priori optimism* has a positive correlation with current income and increase in income in 5 and 10 years' time. *A posteriori optimism* has little to do with current income but is negatively correlated to income in future. Investors' high expectation but low realisation might be the primary reason for the findings using *A posteriori optimism*. Regarding how financial optimism affects wealth, I found financial optimism increase future financial wealth but does not improve overall wealth levels. Perhaps this is because the increase in property values, which is a prominent component of the total wealth measure, greatly outweighed the positive effect of optimism. This shows optimism alone is unlikely to help the financially worse off gain significant advantages over their wealthy less-optimistic peers. The overall finding on optimism and objective well-being is that financial optimism has its beneficial aspects in improving objective well-being but the scale of such effect is limited.

Different measures of financial optimism produce different implications on the relationship between optimism and subjective well-being. *Financial expectation* is significantly positively correlated with both current happiness and life satisfaction but its long-term influence on subjective well-being diminishes. *A priori optimism* and *A posteriori optimism* have little influence on current happiness and satisfaction but *A posteriori optimism* has a negative relationship with the increase in future happiness. It's understandable that if an investor's actual realised financial gains are lower than her expectation, it is likely that she becomes unhappy. Consistent with previous literature, compared to demographics, subjective variables seem have much higher correlations with happiness and satisfaction (Vittersø, 2000). My findings suggest the less financially well-off perhaps do seem to use optimism as a psychological panacea to help stay happy or satisfy themselves, but when reality turns out to be unfavourable compared to optimistic expectation, happiness is often reduced as well.

Chapter 6 explores how feedback on investment returns, framing of scenarios, personality traits, and attitude on risk tolerance influence financial optimism in a controlled environment. I found

people respond to feedback on investment performance differently in alternatively framed forecasting scenarios. By asking participants to forecast portfolio return in absolute values or in percentage terms, the effect of feedback on financial optimism varies. When participants forecast portfolio returns in absolute values, positive feedback on previous portfolio returns reduces financial optimism while positive feedback increases financial optimism when participants forecast returns in relative terms. This finding is consistent with the evidence in the literature that asking for future price levels finds mean reverting expectations, but asking for percentage return forecasts finds trend continuation (De Bondt, 1991; O'Connor, Remus, & Griggs, 1997; Shiller, 2000).

It is confirmed by my results that different experiment settings would lead people to make decisions differently. Framing is found to affect financial optimism directly. *A posteriori optimism* is significantly higher in the situation of forecasting portfolio returns in absolute values compared with forecasting in relative terms. This suggests forecasting values are more likely to lead to larger forecasting errors.

I studied whether financial optimism is linked with certain personality traits. I found financial optimism is negatively correlated with modesty, morality, and liberalism, but positively correlated with cooperation when subjects forecast portfolio returns in absolute values. When forecasting in relative terms, financial optimism is negatively correlated with extraversion, friendliness, and altruism. Regardless which forecasting scenario participants are in, financial optimism is always positively correlated with attitude on risk tolerance. Optimistic individuals are found to invest in portfolios that contain higher level of riskiness when they make forecasts in relative terms.

7.4. Conclusions and Implications

An overall conclusion of this thesis is that financial optimism increases the riskiness in individual investors' portfolios. Although optimists have lower accumulated wealth than non-optimists, they allocate a higher proportion of their wealth in risky assets than risk-free assets. Optimism has a positive impact on borrowing debt and mortgages. Financial optimism helps to increase one's future objective well-being but such positive effect is fairly small compared to some of the effects of demographic variables on material well-being. Optimism may be used as a tactic to cope with financial disadvantages and make one stay happy and satisfied, however, such happiness might not last long once the actual reality of one's financial situation reveals itself. Positive feedback reduces optimism when forecasting portfolio return in absolute values, but it increases optimism if the forecast is made in relative terms. Forecasting in values is also more likely to promote optimism, which shows framing of a decision making situation affects financial optimism directly. Financial optimism is not only positively correlated with an attitude on risk tolerance, but also associated with one's personality. I found in my experiments that financial optimism has a negative relationship with certain personality traits, such as extraversion, altruism, modesty, and morality.

When it comes to financial decision making, individual investors might not think psychological factors would affect their investment choices significantly. This thesis shows the link between psychology and individuals' investment decisions are much closer than many expect. Research in this thesis helps individual investors recognise the effect of optimism on their choice of portfolios. By being optimistic, individuals become more prone to the tendency of neglecting risks in their investment. In fact, optimists prefer to choose portfolios with higher risks. If one is financially optimistic, she should aware that her choice of portfolios might not be derived from the objective analysis of financial and non-financial information but are significantly affect by

her optimistic belief.

This thesis provides advice on whether it is better off for individual investors to be financial optimistic. Optimism triggers increases in future financial wealth level but does not significantly increase total wealth. The overall suggestion is that it is better to be optimistic given the financial situation one is in since it brings in benefits towards the improvement of one's objective well-being. However, an individual should not have an unrealistic expectation on what optimism can do. The positive effect of optimism is not sufficient for an investor to achieve financial superiority over his peers. Optimism might encourage individuals to work hard to obtain better financial status, but such effect on improving their objective well-being is overshadowed by demographic effects such as the increase of property prices of wealthy less-optimistic peers. Regarding financial optimism and subjective well-being, evidence suggests that optimism could be a strategy that people adopt to help themselves feel happy or stay satisfied with the situations they are in. Optimism seems to be beneficial towards one's current subjective well-being. However, one should be conscious about the possible reduction in her future happiness due to the potential low realisation of an optimistic expectation in financial situation.

Although optimism is beneficial to one's well-being to a certain degree, the dilemma is that individuals might have limited control of whether to be optimistic. Optimistic bias does not maintain stability within the same individual. Financial optimism is altered by receiving feedback on previous investment performance. An individual might be more optimistic in one environment than another depending on how situations are framed. Individuals' personality plays a role in shaping optimism. Their attitude towards risks may even determine how optimistic they are regardless of what life events or tasks they are encountered with. In other words, certain groups of people might be more optimistic than others intrinsically. Optimism of an individual is proved to be affected by both environmental and personal factors either

consciously or unconsciously. Overall, individual investors should realise they are not invulnerable towards both internal and external factors which affect their optimistic bias in financial decision making.

7.5. Limitations and Future Work

The BHPS contains many other demographic and finance variables which were beyond the scope of this thesis. For example, there is a host of variables about subjects' pension savings. It would be interesting to extend my research on optimism to include these factors. Future research can be conducted on how financial optimism would relate to people's pension choices and whether optimism could trigger non-participation in pension schemes.

As further waves of BHPS data are published it would be interesting to repeat my experiments incorporating the more recent data. The effect of the credit crunch and recession on optimism should yield useful results. The relationship between financial optimism and investment in risky portfolios may be affected by declining economic situations and should give further insight on the causes of optimism.

I constructed a theoretical framework on the measures of financial optimism with the intention of isolating irrational optimism. An approximation for the rational expected value of a financial decision was used in my *A priori optimism* and *A posteriori optimism* measures. However these approximations might not be the subject's true rational expectation of the investment decision. This was certainly true with the BHPS experiments. While private domain information is completely eliminated in theory via my controlled experiments, and therefore *A priori optimism* may be thought to be true irrational optimism, it is almost inevitable that the unthought-of confounding factors exist even in my controlled experiments. Therefore I do not claim *A priori optimism* is a completely irrational component in my controlled experiments lightly. Future studies can focus on improving experiment design to further isolate irrational financial optimism from other extraneous factors.

Perhaps one way of reducing confounding factors in the controlled experiments is to try to make sure that subjects are financially literate and are able to understand all information relevant to the investment task. For example, I did not inform subjects that investment returns were normally distributed because this would have caused confusion. Most of my subjects did not have a finance or statistics background. In future I can only recruit subjects who have relevant finance knowledge and skills to make correct forecasts for the returns of their portfolio allocation. All information needed to make a rational investment decision in a controlled experiment environment could then be provided to the financially literate subjects. Any bias in subjects' financial decisions would therefore be irrational, rather than due to factors such as the inability to understand the question. Subjects' forecasts that deviate from rational expectation can then be regarded as an effect of irrational optimism.

Another limitation lies in the general criticism that controlled experiments are artificial and do not reflect reality. The behaviour that is observed in controlled experiments might not happen in the same manner in a real investment environment. Besides, what may be deemed as "wrong" behaviour in a controlled experiment might actually be beneficial in real-life. By excluding confounding factors, experiments could deny participants' access to information they need to make rational judgments as in real life situations. Future experiments should make efforts on achieving a balance between controlled experiment settings and providing reasonably realistic information for financial decision making.

One way to make experiment more realistic but at the same time not to introduce extraneous information is to frame essentially the same data or given information in similar ways to how people would process information in a real world situation. In my experiment, instead of providing historical returns in tables of asset performance we can present these in other forms such as in line charts, which shows a general tendency of the asset historical prices and as well as volatility with one glance. Subjects with a poor financial background should find data

presented this way easier to process. Perhaps this is the type of information most lay subjects would prefer to use in making real life finance decisions. Of course, we need to be careful that we do not introduce further confounding factors when graphically presenting financial data. This research on framing and optimism would be beneficial to the general finance community as we will obtain quantitative results on the affect of framing financial data in different forms.

The financial incentives I could provide in my experiments were very limited. As different experiment incentive structures carve out different utility functions for subjects, it would be very interesting to investigate whether participants behave differently with more realistic financial incentives. For example, with a larger research budget, it would be possible for experiment subjects to invest for real monetary gains. The experiment setting can switch from investing an imaginary £1,000 to investing a real £20 in a few artificially designed assets. The experiment procedure will remain similar but there is potential for a real, albeit small, financial gain from the experiment. Subjects will either lose some or all of the initial £20 given at the beginning of the experiment, or win more than £20 at the end of the experiment. This experiment reward structure might work differently with different subject demographic groups as discussed in section 6.4.2.2, I shall expect the implications of experiment results found under such financial incentive settings to be more relevant to real-world decision making domains.

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Appendix

Appendix 1 Original questionnaires in the BHPS for analysis on the relationship between optimism and household portfolio choices

This appendix shows the questionnaires for the employed variables which are selected from Wave 2005 from the BHPS. The wording for some of the questions varies slightly throughout the survey period from 1991 to 2007. However, the slight variation does not affect my data analysis. These variables are used for investigating the relationship between optimism and h portfolio choices.

Question 1	Looking ahead, how do you think you will be financially a year from now, will you be Better off, or worse off than you are now, Or about the same?
Question 2	Would you say that you yourself are Better off, or worse off financially than you were a year ago, Or about the same?
Question 3	I'd like to ask you about any savings and investments you may have. Please look at this card and tell me which types of savings accounts or investments you have, if any. They can be in your name only, held in joint names with your husband/wife/partner or with someone else. None (0); Don't know (98); Refused (99); savings or deposit account, (with a bank, post office or building society) (01); National Savings Bank (Post Office) (02); TESSA only ISA or Cash ISA (03); National Savings Certificates (04); Premium Bonds (05); Unit Trusts/Investment Trusts (excluding ISAs/PEPs) (06); Stocks and shares ISA or PEP (07); Shares (UK or foreign/excluding ISAs and PEPs) (08); National Savings Bonds (Capital, Income or Deposit) (09); Other investments (Gilts, government or company securities) (10)
Question 4	Thinking first about your savings accounts, including your {text fill categories 1, 2, 3}[1], about how much in total is the current balance in these accounts?
Question 5	Thinking now about the investments you have including your {text fill categories from F15}[2] {but NOT including the savings you have just told me about}, about how much is the total value of these investments?
Question 6	I would like to ask you now about any other financial commitments you may have apart from mortgages. Do you currently owe any money on the things listed on this card? Please do not include credit card and other bills being fully paid off in the current month. ... About how much in total is owed on this/these commitment(s)?
Question 7	Would you please tell me your exact date of birth?
Question 8	Interviewer check: respondent is: Male or Female.
Question 9	Marital Status: Married, Living as couple, Widowed, Divorced, Separated, Never married, or Under 16.
Question 10	To which of these ethnic groups do you consider you belong? a) White, b) Mixed, c) Asian or Asian British, d) Black or Black British, and e) Chinese or other ethnic group.
Question 11	Please think back over the last 12 months about how your health has been. Compared to people of your own age, would you say that your health has on the whole been: Excellent, Good, Fair, Poor, Very Poor, or Don't know?
Question 12	Fill out the respondent's person number
Question 13	Does your household own or rent this accommodation or does it come rent-free? Owned/being bought on mortgage, Shared ownership (part-owned part-rented), Rented, Rent free, or Other.

[1] Refers to (01) savings or deposit account, (with a bank, post office or building society), (02) National Savings Bank (Post Office), and (03) TESSA only ISA or Cash ISA

[2] Refers to Question 4

Question 14 How much did you pay for the property?

Question 15 About how much would you expect to get for your home if you sold it today?
(If range given write in lowest figure)

Question 16 Could I just check, approximately how much is the total amount of your outstanding loans on all the property you (or your household) own, including your current home? IF 'DON'T KNOW / CAN'T REMEMBER' PROBE: 'Can you give me an approximate amount?'

Question 17 Are you an employee or self-employed?

Question 18 What was your (main) job last week? Please tell me the exact job title and describe fully the sort of work you do. (if more than one job: main job = job with most hours; if equal hours: main job = highest paid)
ENTER JOB TITLE:_____
DESCRIBE FULLY WORK DONE: (if relevant 'what are the materials made of?')
_____

Question 19 Leaving aside your own personal intentions and circumstances, is your job: A permanent job, or Is there some way that it is not permanent?

Question 20 Which of the following best describes your current situation, Are you (read out and code one only): Self employed, In paid employment (full or part-time), Retired from paid work altogether, Looking after family or home, Full-time student/ at school, Long term sick or disabled, On a government training scheme, Something else (please give details).

Question 21 Which of the following best describes your current situation, Are you (read out and code one only): Self employed, In paid employment (full or part-time), Retired from paid work altogether, Looking after family or home, Full-time student/ at school, Long term sick or disabled, On a government training scheme, Something else (please give details).

Question 22 Which qualifications do you have? (code all that apply)

1) Youth training certificate/Skillseekers, Recognised trade / mocern apprenticeship completed, 2) Clerical and commercial qualifications (eg typing/shorthand/book-keeping/commerce), 3) City & Guilds Certificate - Craft/Intermediate/Ordinary/Part I / or Scotvec National Certificate Modules / or NVQ1/SVQ1, 4) City & Guilds Certificate - Advanced/Final/Part II / or Scotvec Higher National Units / or NVQ2/SVQ2, City & Guilds Certificate - Full Technological/Part III / or Scotvec Higher National Units / or NVQ3/SVQ3, 5) Ordinary National Certificate (ONC) or Diploma (OND), 6) BEC/TEC/BTEC / Scotvec National Certificate or Diploma / or NVQ3/SVQ3, 7) Higher National Certificate (HNC) or Diploma (HND), 8) BEC/TEC/BTEC / Scotvec Higher Certificate or Higher Diploma / or NVQ4/SVQ4, 9) Nursing qualifications (eg SEN, SRN, SCM, RGN), 10) Teaching qualifications (not degree), 11) University diploma, 12) University or CNAA First Degree (eg BA, B.Ed, BSc), 13) University or CNAA Higher Degree (eg MSc, PhD), or 14) Other technical, professional or higher qualifications.

Appendix 2 Descriptive statistics for all individuals and the head of the household in wave 1995

This table reports the mean, standard deviations, minimum values, maximum values, and the number of observations of the demographic variables selected from Wave 1995 of the BHPS. The variables are grouped into Personal Characteristics, Wealth and Income, Employment Profile. Numbers without brackets are the values for all the individuals in the BHPS. Numbers within brackets are for the head of the household only.

	1995 All Individuals (Head of Household)									
	Mean		Sdv		Min		Max		N	
Heuristics of optimism										
Financial expectation	1.14	(1.10)	0.61	(0.59)	0	(0)	2	(2)	9249	(4800)
A priori optimism	0.15	(0.17)	0.86	(0.81)	-2	-(2)	2	(2)	9249	(4800)
A posteriori optimism	0.09	(0.08)	0.80	(0.78)	-2	-(2)	2	(2)	8612	(4508)
Risk-free portfolios										
Savings (SAV)	3699.27	(4275.50)	17109.75	(13020.03)	0	(0)	900000	(230000)	9249	(4800)
SAV/FW	0.73	(0.70)	0.36	(0.37)	0	(0)	1	(1)	5315	(2803)
SAV/TW	0.15	(0.18)	0.31	(0.33)	0	(0)	1	(1)	7671	(3884)
SAV/HINC	0.23	(0.60)	0.92	(5.06)	0	(0)	33	(300)	9089	(4547)
SAV/INV	5.48	(4.78)	33.87	(18.40)	0	(0)	1330	(333)	2394	(1404)
Risky portfolios										
Investment (INV)	4163.71	(5393.20)	23203.51	(24271.24)	0	(0)	999999	(800000)	9249	(4800)
INV/FW	0.27	(0.30)	0.36	(0.37)	0	(0)	1	(1)	5315	(2803)
INV/TW	0.05	(0.07)	0.16	(0.17)	0	(0)	1	(1)	7671	(3884)
(INV + CHV)/TW	0.85	(0.82)	0.31	(0.33)	0	(0)	1	(1)	7671	(3884)
INV/HINC	0.24	(0.55)	2.43	(4.24)	0	(0)	200	(200)	9089	(4547)
Debt										
Personal Debt (PD)	746.23	(894.55)	2914.38	(3647.42)	0	(0)	99999	(99999)	9249	(4800)
PD/TD	0.28	(0.31)	0.43	(0.44)	0	(0)	1	(1)	5483	(2668)
MG/TD	0.97	(0.96)	0.08	(0.09)	0	(0)	1	(1)	4075	(1922)
PD/INC	0.11	(0.10)	0.67	(0.77)	0	(0)	33	(33)	8459	(4515)
MG/HINC	1.74	(2.03)	7.09	(9.92)	0	(0)	413	(413)	4075	(1922)
PD/TW	0.20	(0.18)	2.95	(2.46)	0	(0)	168	(100)	7671	(3884)
MG/TW	1.05	(1.18)	9.80	(11.32)	0	(0)	300	(300)	4039	(1902)
Demographic Variables										
Age	44.02	(49.41)	18.49	(18.20)	15	(16)	96	(96)	9249	(4800)
Male	0.47	(0.68)	0.50	(0.47)	0	(0)	1	(1)	9249	(4800)
Married	0.64	(0.61)	0.48	(0.49)	0	(0)	1	(1)	9249	(4800)
White	0.95	(0.95)	0.23	(0.22)	0	(0)	1	(1)	9249	(4800)
Healthy	0.91	(0.90)	0.28	(0.30)	0	(0)	1	(1)	9249	(4800)
Household size	2.88	(2.46)	1.38	(1.33)	1	(1)	11	(11)	9249	(4800)
Home ownership	0.70	(0.66)	0.46	(0.47)	0	(0)	1	(1)	9249	(4800)
Home purchase price	36246.42	(35916.80)	41949.08	(42987.92)	1	(1)	999997	(999997)	6025	(3216)
Current home value	76152.10	(73372.90)	53153.61	(51706.71)	250	(250)	685000	(685000)	6570	(3231)
Mortgage outstanding	38137.72	(38824.13)	39732.18	(39925.58)	68	(68)	1000000	(1000000)	4075	(1922)
Education: first degree or above	0.27	(0.30)	0.44	(0.46)	0	(0)	1	(1)	9249	(4800)
Employment: permanent contract	0.51	(0.50)	0.50	(0.50)	0	(0)	1	(1)	9249	(4800)
Business ownership	0.11	(0.13)	0.32	(0.34)	0	(0)	1	(1)	9249	(4800)
Unemployed	0.04	(0.04)	0.20	(0.20)	0	(0)	1	(1)	9249	(4800)
Unemployed a year ago	0.04	(0.04)	0.20	(0.20)	0	(0)	1	(1)	9249	(4800)
Finance related occupation	0.05	(0.05)	0.22	(0.21)	0	(0)	1	(1)	9249	(4800)
Annual income	9583.68	(12300.99)	10536.03	(11721.40)	0	(0)	292060	(292060)	9249	(4800)
Annual household income	22141.11	(19252.28)	16966.98	(16466.10)	0	(0)	300301	(300301)	9249	(4800)
Total financial wealth	7864.82	(9670.18)	32384.77	(31730.80)	0	(0)	1114999	(870000)	9249	(4800)
Total wealth	61959.24	(59059.32)	70890.59	(70653.60)	0	(0)	1464999	(970000)	9249	(4800)

Appendix 3 Descriptive statistics for all individuals and the head of the household in wave 2000

This table reports the mean, standard deviations, minimum values, maximum values, and the number of observations of the demographic variables selected from Wave 2000 of the BHPS. The variables are grouped into Personal Characteristics, Wealth and Income, Employment Profile. Numbers without brackets are the values for all the individuals in the BHPS. Numbers within brackets are for the head of the household only.

	2000 All Individuals (Head of Household)									
	Mean		**Sdv**		**Min**		**Max**		**N**	
Heuristics of optimism										
Financial expectation	1.21	(1.18)	0.57	(0.56)	0	(0)	2	(2)	15603	(8291)
A priori optimism	0.12	(0.14)	0.83	(0.80)	-2	-(2)	2	(2)	15603	(8291)
A posteriori optimism	0.10	(0.09)	0.78	(0.77)	-2	-(2)	2	(2)	14258	(7662)
Risk-free portfolios										
Savings (SAV)	3196.78	(3781.25)	11094.36	(12793.63)	0	(0)	350000	(350000)	15603	(8291)
SAV/FW	0.75	(0.72)	0.36	(0.37)	0	(0)	1	(1)	8151	(4306)
SAV/TW	0.14	(0.17)	0.30	(0.33)	0	(0)	1	(1)	12488	(6393)
SAV/HINC	0.18	(0.70)	0.96	(13.37)	0	(0)	45	(833)	15321	(7929)
SAV/INV	7.73	(9.12)	47.10	(58.38)	0	(0)	1168	(1168)	3560	(2075)
Risky portfolios										
Investment (INV)	3137.52	(3969.39)	17509.31	(19865.57)	0	(0)	500000	(500000)	15603	(8291)
INV/FW	0.25	(0.28)	0.36	(0.37)	0	(0)	1	(1)	8151	(4306)
INV/TW	0.04	(0.05)	0.14	(0.16)	0	(0)	1	(1)	12488	(6393)
(INV + CHV)/TW	0.86	(0.83)	0.30	(0.33)	0	(0)	1	(1)	12488	(6393)
INV/HINC	0.16	(1.47)	2.26	(93.78)	0	(0)	252	(8333)	15321	(7929)
Debt										
Personal Debt (PD)	1286.05	(1446.14)	4966.07	(5845.52)	0	(0)	400000	(400000)	15603	(8291)
PD/TD	0.33	(0.37)	0.45	(0.46)	0	(0)	1	(1)	8918	(4439)
MG/TD	0.96	(0.95)	0.09	(0.09)	0	(0)	1	(1)	6217	(2931)
PD/INC	0.21	(0.17)	1.31	(1.14)	0	(0)	52	(41)	14407	(7882)
MG/HINC	1.61	(1.77)	2.53	(2.55)	0	(0)	113	(68)	6212	(2927)
PD/TW	0.39	(0.44)	3.68	(4.10)	0	(0)	108	(102)	12488	(6393)
MG/TW	1.01	(1.18)	11.24	(11.28)	0	(0)	612	(400)	6184	(2910)
Demographic Variables										
Age	45.19	(50.35)	18.60	(17.99)	15	(16)	101	(99)	15603	(8291)
Male	0.46	(0.66)	0.50	(0.48)	0	(0)	1	(1)	15603	(8291)
Married	0.64	(0.59)	0.48	(0.49)	0	(0)	1	(1)	15603	(8291)
White	0.96	(0.96)	0.20	(0.19)	0	(0)	1	(1)	15603	(8291)
Healthy	0.89	(0.88)	0.31	(0.33)	0	(0)	1	(1)	15603	(8291)
Household size	2.84	(2.42)	1.38	(1.32)	1	(1)	11	(11)	15603	(8291)
Home ownership	0.69	(0.64)	0.46	(0.48)	0	(0)	1	(1)	15603	(8291)
Home purchase price	40370.76	(39076.09)	42335.21	(42210.66)	1	(1)	999997	(999997)	9631	(5216)
Current home value	101847.48	(97706.32)	80750.89	(77399.38)	2000	(2000)	999999	(999999)	10852	(5379)
Mortgage outstanding	45076.73	(45088.89)	44576.19	(43090.29)	100	(100)	800000	(800000)	6217	(2931)
Education: first degree or above	0.32	(0.35)	0.47	(0.48)	0	(0)	1	(1)	15603	(8291)
Employment: permanent contract	0.53	(0.51)	0.50	(0.50)	0	(0)	1	(1)	15603	(8291)
Business ownership	0.09	(0.11)	0.29	(0.32)	0	(0)	1	(1)	15603	(8291)
Unemployed	0.04	(0.03)	0.19	(0.18)	0	(0)	1	(1)	15603	(8291)
Unemployed a year ago	0.03	(0.03)	0.18	(0.18)	0	(0)	1	(1)	15603	(8291)
Finance related occupation	0.05	(0.04)	0.21	(0.20)	0	(0)	1	(1)	15603	(8291)
Annual income	11398.59	(14182.74)	11722.34	(13129.75)	0	(0)	397320	(397320)	15603	(8291)
Annual household income	25518.99	(21961.45)	18983.44	(18027.93)	0	(0)	397320	(397320)	15603	(8291)
Total financial wealth	6335.81	(7752.01)	23300.18	(26533.17)	0	(0)	550000	(505000)	15603	(8291)
Total wealth	77171.47	(71141.50)	90433.55	(88881.45)	0	(0)	1239999	(1239999)	15603	(8291)

Appendix 4 Descriptive statistics for all individuals and the head of the household in wave 2005

This table reports the mean, standard deviations, minimum values, maximum values, and the number of observations of the demographic variables selected from Wave 2005 of the BHPS. The variables are grouped into Personal Characteristics, Wealth and Income, Employment Profile. Numbers without brackets are the values for all the individuals in the BHPS. Numbers within brackets are for the head of the household only.

	2005 All Individuals (Head of Household)									
	Mean		Sdv		Min		Max		N	
Heuristics of optimism										
Financial expectation	1.17	(1.13)	0.56	(0.55)	0	(0)	2	(2)	15627	(8109)
A priori optimism	0.12	(0.13)	0.794	(0.77)	-2	-(2)	2	(2)	15627	(8109)
A posteriori optimism	0.12	(0.12)	0.751	(0.73)	-2	-(2)	2	(2)	14435	(7569)
Risk-free portfolios										
Savings (SAV)	4258.94	(5090.23)	16135.501	(18483.90)	0	(0)	500000	(500000)	15627	(8109)
SAV/FW	0.79	(0.76)	0.344	(0.36)	0	(0)	1	(1)	7312	(3928)
SAV/TW	0.1	(0.12)	0.261	(0.29)	0	(0)	1	(1)	12914	(6539)
SAV/HINC	0.2	(2.95)	1.044	(183.57)	0	(0)	63	(15833)	14913	(7535)
SAV/INV	10.29	(9.83)	56.411	(48.79)	0	(0)	1700	(1322)	2905	(1729)
Risky portfolios										
Investment (INV)	3121.27	(4233.02)	20815.139	(25257.65)	0	(0)	900000	(900000)	15627	(8109)
INV/FW	0.21	(0.24)	0.344	(0.36)	0	(0)	1	(1)	7312	(3928)
INV/TW	0.02	(0.03)	0.1	(0.12)	0	(0)	1	(1)	12914	(6539)
(INV + CHV)/TW	0.9	(0.88)	0.261	(0.29)	0	(0)	1	(1)	12914	(6539)
INV/HINC	0.12	(0.34)	0.903	(5.39)	0	(0)	46	(333)	14913	(7535)
Debt										
Personal Debt (PD)	1843.37	(2000.20)	7306.902	(7055.06)	0	(0)	400000	(240000)	15627	(8109)
PD/TD	0.3	(0.34)	0.434	(0.45)	0	(0)	1	(1)	8410	(4130)
MG/TD	0.96	(0.95)	0.096	(0.10)	0	(0)	1	(1)	6115	(2876)
PD/INC	0.27	(0.18)	2.474	(1.94)	0	(0)	133	(133)	13946	(7497)
MG/HINC	2.81	(3.20)	37.178	(38.99)	0	(0)	2015	(2015)	6113	(2874)
PD/TW	0.54	(0.59)	6.969	(6.90)	0	(0)	286	(233)	12914	(6539)
MG/TW	1.33	(1.39)	24.799	(23.51)	0	(0)	1000	(1000)	6091	(2863)
Demographic Variables										
Age	45.93	(51.52)	18.694	(17.68)	15	(16)	99	(99)	15627	(8109)
Male	0.46	(0.67)	0.498	(0.47)	0	(0)	1	(1)	15623	(8106)
Married	0.64	(0.59)	0.481	(0.49)	0	(0)	1	(1)	15627	(8109)
White	0.96	(0.97)	0.202	(0.17)	0	(0)	1	(1)	15627	(8109)
Healthy	0.91	(0.90)	0.29	(0.31)	0	(0)	1	(1)	15627	(8109)
Household size	2.88	(2.44)	1.42	(1.34)	1	(1)	14	(13)	15627	(8109)
Home ownership	0.75	(0.72)	0.431	(0.45)	0	(0)	1	(1)	15627	(8109)
Home purchase price	46445.77	(44122.26)	51020.12	(49018.67)	1	(1)	999997	(999997)	10205	(5672)
Current home value	193368.94	(186372.76)	155469.254	(149711.41)	1	(1)	4000000	(4000000)	11801	(5833)
Mortgage outstanding	71261.93	(73119.17)	117441.868	(152670.31)	150	(150)	7299999	(7299999)	6115	(2876)
Education: first degree or above	0.37	(0.40)	0.483	(0.49)	0	(0)	1	(1)	15627	(8109)
Employment: permanent contract	0.53	(0.53)	0.499	(0.50)	0	(0)	1	(1)	15627	(8109)
Business ownership	0.1	(0.12)	0.295	(0.33)	0	(0)	1	(1)	15627	(8109)
Unemployed	0.03	(0.03)	0.176	(0.16)	0	(0)	1	(1)	15627	(8109)
Unemployed a year ago	0.02	(0.02)	0.155	(0.15)	0	(0)	1	(1)	15627	(8109)
Finance related occupation	0.04	(0.04)	0.193	(0.19)	0	(0)	1	(1)	15627	(8109)
Annual income	14037.27	(17605.72)	16600.654	(19574.54)	0	(0)	1009984	(1009984)	15627	(8109)
Annual household income	31735.55	(27750.43)	25290.482	(25607.92)	0	(0)	1009984	(1009984)	15627	(8109)
Total financial wealth	7381.25	(9324.21)	30274.184	(36431.37)	0	(0)	1400000	(1400000)	15627	(8109)
Total wealth	153407.16	(143386.65)	166823.244	(163965.14)	0	(0)	4100000	(4100000)	15627	(8109)

Appendix 5 Financial optimism and portfolio choices for all individual investors in 1995, 2000, and 2005

This table reports the regression results for using the ratio of risk-free assets to financial wealth (SAV/FW), the ratio of investment to financial wealth (INV/FW), the level of unsecured debt (Ln(PD)) as dependent variables for estimation respectively. Variables including financial optimism and demographics are the independent variables in the regression. *Financial expectation*, *A priori optimism*, and *A posteriori optimism* listed in the left column are used as measures of Financial optimism. Beta coefficients and the *p*-values associated with financial optimism in 1995, 2000, and 2005 are reported under each portfolio measure in the rest of the columns.

	Portfolio Choices					
	Risk-free (SAV/FW)		**Risky (INV/FW)**		**Debt (Ln(PD))**	
	Beta	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**
1995						
Financial expectation	0.010	0.435	-0.100	0.435	0.033	0.007
A Priori Optimism	-0.047	0.000	0.047	0.000	0.029	0.015
A Posteriori Optimism	0.014	0.292	-0.140	0.292	0.032	0.007
2000						
Financial expectation	-0.010	0.369	0.010	0.369	0.049	0.000
A Priori Optimism	-0.050	0.000	0.050	0.000	0.068	0.000
A Posteriori Optimism	-0.048	0.000	0.048	0.000	0.031	0.002
2005						
Financial expectation	0.000	0.985	0.000	0.985	0.061	0.000
A Priori Optimism	-0.031	0.004	0.031	0.004	0.076	0.000
A Posteriori Optimism	-0.008	0.470	0.008	0.470	0.030	0.005

Appendix 6 Financial optimism and the ratio of risky assets to financial wealth for all individual investors

This table reports the regression results for using home value to financial wealth as a definition of risky portfolios. Variables listed in the left column including financial optimism and demographics are independent variables for the regression. The ratio of current value of personal residence to financial wealth (VPR/FW) in the first row is the dependent variable in the regression equation. Beta coefficients and the *p*-values associated with each coefficient are reported in the rest of the columns. *Financial expectation*, *A priori optimism*, and *A posteriori optimism* are used as measures of Financial optimism with coefficients and *p*-values reported respectively under each measure.

	Risky Portfolios: VPR/FW					
	Financial Expectation		**A Priori Optimism**		**A Posteriori Optimism**	
	Beta	***p*-Value**	**Beta**	***p*-Value**	**Beta**	***p*-Value**
Financial expectation	-0.020	0.000	0.014	0.008	-0.004	0.488
Age	0.062	0.000	0.068	0.000	0.054	0.000
Male	0.006	0.304	0.005	0.358	0.006	0.250
Married	0.135	0.000	0.135	0.000	0.119	0.000
White	-0.019	0.001	-0.018	0.001	-0.017	0.002
Healthy	0.014	0.008	0.015	0.006	0.014	0.010
Household size	0.073	0.000	0.073	0.000	0.090	0.000
Annual income (ln)	-0.175	0.000	-0.177	0.000	-0.165	0.000
Annual household income (ln)	0.108	0.000	0.109	0.000	0.110	0.000
Business ownership	-0.001	0.847	-0.002	0.703	-0.003	0.564
Finance related occupation	0.018	0.001	0.018	0.001	0.022	0.000
Employment: permanent contract	0.120	0.000	0.120	0.000	0.110	0.000
Unemployed	0.016	0.007	0.012	0.039	0.002	0.684
Unemployed a year ago	-0.035	0.000	-0.034	0.000	-0.034	0.000
Education: first degree or above	0.031	0.000	0.030	0.000	0.031	0.000
R Square	0.066		0.066		0.066	

Appendix 7 Original questionnaires from the BHPS for analysis on the relationship between optimism and well-being

This appendix shows the questionnaires for the employed variables which are selected from Wave 2005 from the BHPS. The wording for some of the questions varies slightly throughout the survey period from 1991 to 2007. However, the slight variation does not affect my data analysis. These variables are used for examining the correlations between optimism and objective and subjective well-being.

Question 1	Looking ahead, how do you think you will be financially a year from now, will you be Better off, or worse off than you are now, Or about the same?
Question 2	Would you say that you yourself are Better off, or worse off financially than you were a year ago, Or about the same?
Question 3	I'd like to ask you about any savings and investments you may have. Please look at this card and tell me which types of savings accounts or investments you have, if any. They can be in your name only, held in joint names with your husband/wife/partner or with someone else. None (0); Don't know (98); Refused (99); savings or deposit account, (with a bank, post office or building society) (01); National Savings Bank (Post Office) (02); TESSA only ISA or Cash ISA (03); National Savings Certificates (04); Premium Bonds (05); Unit Trusts/Investment Trusts (excluding ISAs/PEPs) (06); Stocks and shares ISA or PEP (07); Shares (UK or foreign/excluding ISAs and PEPs) (08); National Savings Bonds (Capital, Income or Deposit) (09); Other investments (Gilts, government or company securities) (10)
Question 4	Thinking first about your savings accounts, including your {text fill categories 1, 2, 3}[1], about how much in total is the current balance in these accounts?
Question 5	Thinking now about the investments you have including your {text fill categories from F15}[2] {but NOT including the savings you have just told me about}, about how much is the total value of these investments?
Question 6	I would like to ask you now about any other financial commitments you may have apart from mortgages. Do you currently owe any money on the things listed on this card? Please do not include credit card and other bills being fully paid off in the current month. ... About how much in total is owed on this/these commitment(s)?
Question 7	Would you please tell me your exact date of birth?
Question 8	Interviewer check: respondent is: Male or Female.
Question 9	Marital Status: Married, Living as couple, Widowed, Divorced, Separated, Never married, or Under 16.
Question 10	To which of these ethnic groups do you consider you belong? a) White, b) Mixed, c) Asian or Asian British, d) Black or Black British, and e) Chinese or other ethnic group.
Question 11	Please think back over the last 12 months about how your health has been. Compared to people of your own age, would you say that your health has on the whole been: Excellent, Good, Fair, Poor, Very Poor, or Don't know?
Question 12	Fill out the respondent's person number
Question 13	Does your household own or rent this accommodation or does it come rent-free? Owned/being bought on mortgage, Shared ownership (part-owned part-rented), Rented, Rent free, or Other.
Question 14	Are you an employee or self-employed?
Question 15	What was your (main) job last week? Please tell me the exact job title and describe fully the sort of work you do. (if more than one job: main job = job with most hours; if equal hours: main job = highest paid)

[1] Refers to (01) savings or deposit account, (with a bank, post office or building society), (02) National Savings Bank (Post Office), and (03) TESSA only ISA or Cash ISA

[2] Refers to Question 4

ENTER JOB TITLE:_____

DESCRIBE FULLY WORK DONE: (if relevant 'what are the materials made of?')

_____

Question 16 Leaving aside your own personal intentions and circumstances, is your job: A permanent job, or Is there some way that it is not permanent?

Question 17 How many people are employed at the place where you work? Include all employees including part-time and shift workers: 1-2 (01); 3 - 9 (02); 10 - 24 (03); 25 - 49 (04); 50 - 99 (05); 100 - 199 (06); 200 - 499 (07); 500 - 999 (08); 1000 or more (09); Don't know but fewer than 25 (10); Don't know but 25 or more (11).

Question 18 Which of the following best describes your current situation, Are you (read out and code one only): Self employed, In paid employment (full or part-time), Retired from paid work altogether, Looking after family or home, Full-time student/ at school, Long term sick or disabled, On a government training scheme, Something else (please give details).

Question 19 Which of the following best describes your current situation, Are you (read out and code one only): Self employed, In paid employment (full or part-time), Retired from paid work altogether, Looking after family or home, Full-time student/ at school, Long term sick or disabled, On a government training scheme, Something else (please give details).

Question 20 Which qualifications do you have? (code all that apply)

2) Youth training certificate/Skillseekers, Recognised trade / mocern apprenticeship completed, 2) Clerical and commercial qualifications (eg typing/shorthand/book-keeping/commerce), 3) City & Guilds Certificate - Craft/Intermediate/Ordinary/Part I / or Scotvec National Certificate Modules / or NVQ1/SVQ1, 4) City & Guilds Certificate - Advanced/Final/Part II / or Scotvec Higher National Units / or NVQ2/SVQ2, City & Guilds Certificate - Full Technological/Part III / or Scotvec Higher National Units / or NVQ3/SVQ3, 5) Ordinary National Certificate (ONC) or Diploma (OND), 6) BEC/TEC/BTEC / Scotvec National Certificate or Diploma / or NVQ3/SVQ3, 7) Higher National Certificate (HNC) or Diploma (HND), 8) BEC/TEC/BTEC / Scotvec Higher Certificate or Higher Diploma / or NVQ4/SVQ4, 9) Nursing qualifications (eg SEN, SRN, SCM, RGN), 10) Teaching qualifications (not degree), 11) University diploma, 12) University or CNAA First Degree (eg BA, B.Ed, BSc), 13) University or CNAA Higher Degree (eg MSc, PhD), or 14) Other technical, professional or higher qualifications.

Question 21 Was/were your hospital stay(s) free under the National Health Service or paid for privately? All free under the NHS (1); All paid for privately (2); Some NHS/ some private (3); Don't know (8).

Question 22 Have you recently felt that you were playing a useful part in things? More than usual; Same as usual; Less so than usual; Much less than usual.

Question 23 Have you recently felt constantly under strain? Not at all; No more than usual; Rather more than usual; Much more than usual.

Question 24 Have you recently felt you couldn't overcome your difficulties? Not at all; No more than usual; Rather more than usual; Much more than usual.

Question 25 Have you recently been able to enjoy your normal day-to-day activities? More so than usual; Same as usual; Less so than usual; Much less than usual.

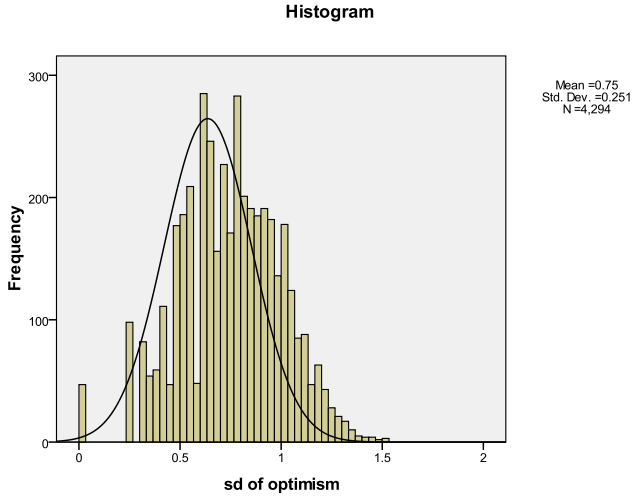
Question 26 Have you recently been feeling unhappy or depressed? Not at all; No more than usual; Rather more than usual; Much more than usual.

Question 27 Have you recently been losing confidence in yourself? Not at all; Not more than usual; Rather more than usual; Much more than usual.

Question 28 Have you recently been thinking of yourself as a worthless person? Not at all;
No more than usual; Rather more than usual; Much more than usual.

Appendix 8 Frequency distribution on A priori optimism for people who are interviewed from 1991 to 2007

This appendix shows the frequency distribution on the standard deviation of optimism level by using *A priori optimism* measure. Only people who were interviewed from 1991 to 2007 continuously are selected for this analysis. The total number of people were selected is 4294 with the average value of the standard deviation on optimism being 0.75. The lateral axis indicates the standard deviation of optimism while the vertical axis represents the frequency distribution.



Appendix 9 Assumptions of the Modern Portfolio Theory[1]

The Modern portfolio theory makes the following assumptions about investors and markets.

- Asset returns are normally distributed random variables.
- Correlations between assets are fixed and constant forever.
- Investors aim to maximize economic utility.
- Investors are rational and risk-averse.
- Investors have access to the same information.
- Investors have an accurate conception of possible returns.
- There are no taxes or transaction costs.
- Investors are price takers.
- Investor can lend and borrow an unlimited amount at the risk free rate of interest.
- All securities can be bought of any quantities.

[1] Harry M. Markowitz - Autobiography, The Nobel Prizes 1990, Editor Tore Frängsmyr, [Nobel Foundation], Stockholm, 1991
Andrei Shleifer: Inefficient Markets: An Introduction to Behavioral Finance. Clarendon Lectures in Economics (2000)
Markowitz, H.M. (1959). Portfolio Selection: Efficient Diversification of Investments. New York: John Wiley & Sons.